FOOD MANUFACTURE

Incorporating Food Industries Weekly

D HILL LIMITED, 17, STRATFORD PLACE, LONDON, W.1 APRIL 3, 194

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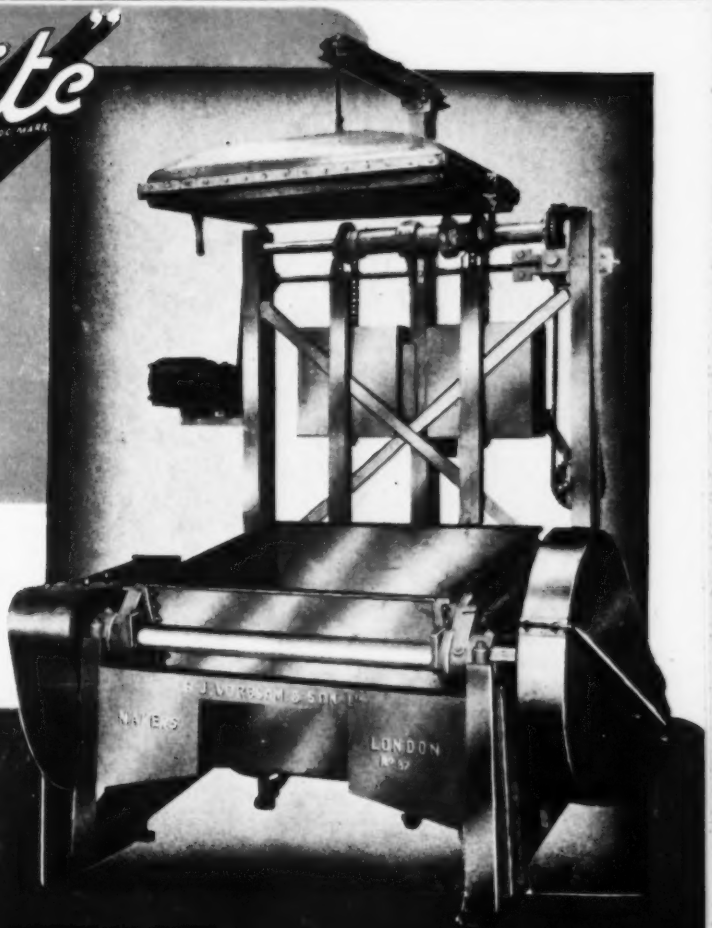
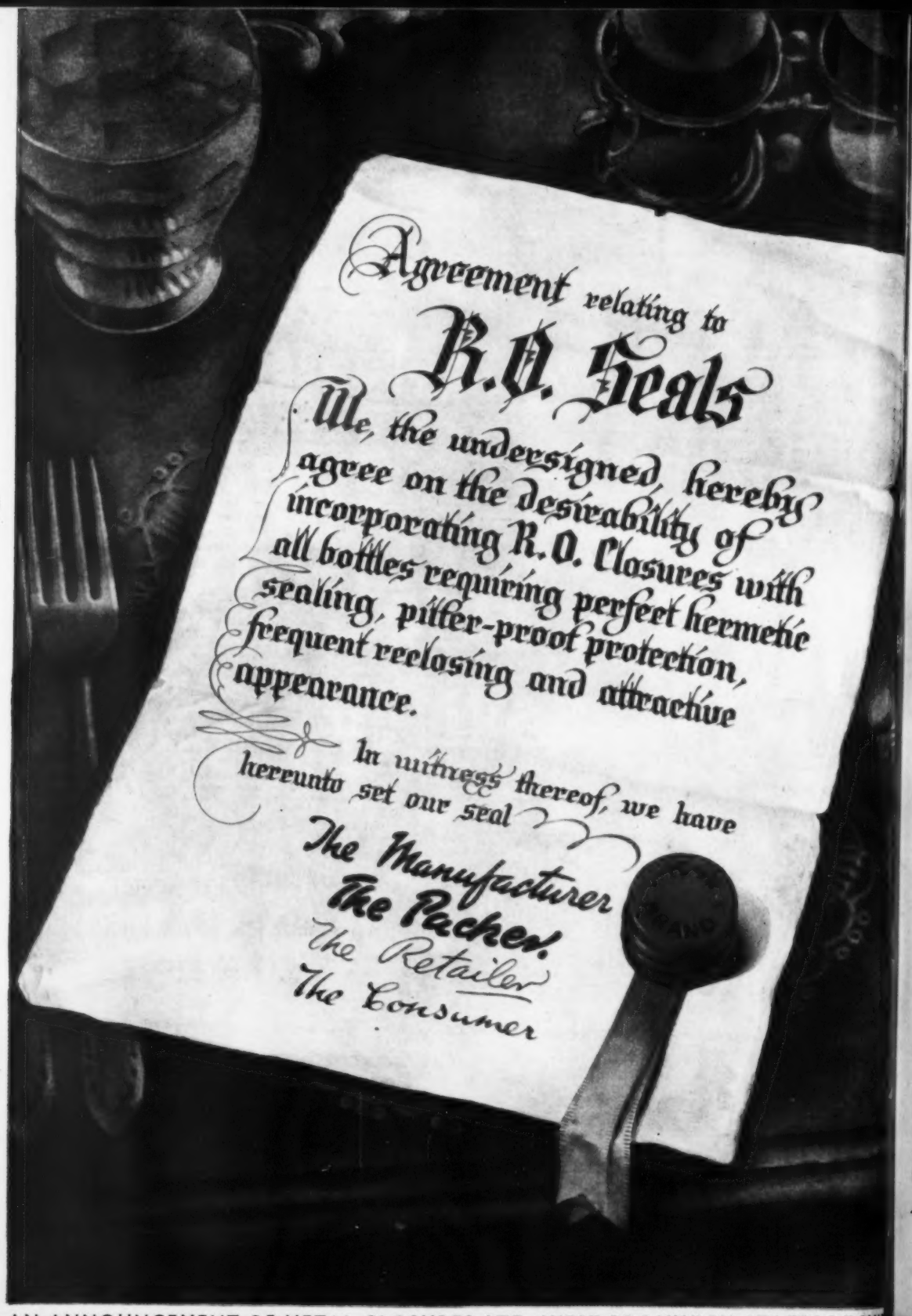


FIRTH-VICKERS STAINLESS STEELS LTD SHEFFIELD


Agreement relating to
R.O. Seals
We, the undersigned, hereby agree on the desirability of incorporating R.O. Closures with all bottles requiring perfect hermetic sealing, pilfer-proof protection, frequent reclosing and attractive appearance.
In witness thereof, we have hereunto set our seal
The Manufacturer
The Packer.
The Retailer
The Consumer
BRAND

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FOOD MANUFACTURE

Vol. XXII, No. 4 April 1, 1947

Nutrition in Britain

AS examples of flat contradiction, the published utterances on the nutrition of the British people are hard to beat.

For example, Mr. Churchill, speaking in the House of Commons on March 12, said that "we are told that our people get an extra 1,300 Calories from foods outside the rationed types" and he wanted to know where they came from. He added that the British people are undernourished today. Mr. Crookshank presages "actual starvation, brute and stark" unless more work is done. Sir John Boyd Orr is reported to have said in Glasgow recently that "the food problem in Britain today is worse than at any time during the war." Dr. Fitzgerald, the Secretary General of the International Emergency Food Council, said more recently that our ration was now 200 Calories less than last winter. Last month, Dr. Summerskill declared that our ration corresponded to 1,600 Calories per day, taking into account the extra food which was bought on points.

These statements should be compared with those given by the Minister of Food. He recently stated that "the poorest third of the people are consuming far more food than they did before the war." Mr. Hynd claims that "already in this country the people are probably enjoying the highest standard of living in the world."

In the White Paper "Economic Survey for 1947," it is stated that "except for milk, the supply of which is steadily increasing, output of livestock products in the year from June 1, 1947, will be little above that of the current livestock year. But the Government's policy is to switch back as soon as it can. Any additional feeding stuffs which become available in the next few months will be used in the main to increase pig and poultry breeding stock. Present restrictions upon retention of grain by growers must continue for the 1947 harvest, but farmers will be allowed to retain some of their millable wheat and barley from the 1948 harvest."

But we are not told how feeding stuffs are going to be obtained.

The trouble is that on such a subject no generalisations are possible. Apart from food in terms of Calories, more protective foods and more variety are required and there seems little doubt but that, as a whole, the population is suffering from a measure of inertia and irritability due to the shortcomings of the diet.

World Meat Production

According to a recent analysis by the U.S. Department of Agriculture, world meat production for the present year probably will be the same or somewhat larger than in 1946. Australia, New Zealand, and America are expected to maintain 1946 production levels, and the expected drop in Canadian output will be partially offset by a rise in Argentine production. Greater recovery is forecast for Continental Europe, Eire, and the United Kingdom.

This generally improved position is traced to better world pastures and feed situation. Many of the Continental European countries have increased animal numbers and are making a gradual recovery, though they are yet far from pre-war levels.

In spite of these general improvements, meat supplies entering into world trade in the 1946-1947 season from the principal exporting countries are expected to be smaller than the 5,900,000,000 lb. reported during 1945-1946.

It is probable that once again imports desired by the United Kingdom and other importing countries for the season under review will be in excess of exportable supplies.

Domestic supplies in the United Kingdom for the past season totalled only 2,000,000,000 lb. compared with the pre-war figure of 2,815,000,000 lb., and to meet its requirements the United King-

dom has to rely primarily on supplies from abroad. During 1946-1947 there will be little opportunity, if any, to acquire supplies larger than those imported in the 1945-1946 period, amounting to 3,500,000,000 lb.

The Sugar Situation

Restrictions on the supply of sugar to food manufacturers are expected to continue until 1949 at the earliest.

According to an American estimate, the minimum normal world demand for sugar totals 35,875,000 short tons annually, of which Europe (including Britain) consumes 13,500,000 tons. Possible production during 1947 is estimated at 33,465,000 short tons, leaving a deficit of 2,410,000 tons. The world position should be easier than in 1946 when the deficit was 6,908,000 tons.

The British and European position will depend largely on the attitude of America in regard to the Cuban crop, and the Director of Sugar has crossed the Atlantic to see what he can do.

Cuba is the largest sugar exporting country, and this year's surplus is expected to be about 5,150,000 short tons. The United States would have to import 5,500,000 short tons, and Europe (including Britain) 5,000,000 short tons to meet their respective minimum normal requirements this year.

Hitherto the United States have allowed the Cuban crop to be used to maintain rations in Europe and other importing areas; but if America should decide to end sugar rationing in her own country it will be necessary to retain the whole of Cuba's exportable surplus for consumption in the United States. The effect of such a policy on the sugar situation in Britain would be serious.

Not until 1948 can the world production of sugar be raised sufficiently to meet the minimum normal demand. Experts believe that several non-belligerent countries could produce more sugar than they are doing. They also believe that the "minimum normal demand" for sugar will increase within the next few years.

Eating the Slipper Limpet

In the severe winter of 1939-40 most of the oysters inhabiting beds in the Thames Estuary were killed off by cold, and since then the beds have become breeding grounds for the slipper-limpet (*Crepidula fornicata*). As a means of disposing of the limpets in as economic a way as possible before restocking the beds, it has been suggested that the limpets be used as food for human consumption. It is estimated that 30 tons could be dredged daily.

A product containing slipper-limpet meat was put on the market in Germany, but the manufacturing process was kept a secret. In the Netherlands slipper-limpet meat was first used in 1929. Since then it has been consumed on an increasing scale, and in 1942 14,500,000 kg. of the meat were used. Machines have been developed for separating the meat from the rest of the limpet.

Teaching your Grandmother . . .

The advertisement headed "Every Farm a Better Farm" issued by the Ministry of Agriculture has produced considerable resentment among the farming community.

From the wording of the advice given, the inference might be drawn that farmers are a set of morons, who are ignorant even of elementary knowledge of their own business.

The advertisement starts off with the precept: "the success of a sound and permanent agricultural policy depends on the efficiency of the individual farmer." Then follows a collection of admonitions which savours of the kindergarten schoolroom and which any business man, be he farmer or manufacturer, must resent.

"Make the best of your labour. Take care of your machinery. Have a definite breeding policy for livestock. Make the best of everything you have got," are some of the exhortations.

Mr. A. G. Street writing in *The Farmers' Weekly* calls the effort "a public insult," but we are inclined to think it will produce considerable hilarity on market days in places where farmers do congregate. They have, as a body, a pretty sense of humour.

Fuel Efficiency

The Ministry of Fuel and Power expects the fuel supply position to be difficult for several years, and it is declared to be in the national interest as well as their own that food manufacturing concerns should make the most efficient use of their fuel.

With this object in view, courses of instruction in boilerhouse practice, containing both theoretical and practical instruction, have been brought to the attention of education authorities and technical colleges.

The syllabus is in three parts; preliminary, intermediate, and advanced, and the subjects dealt with include fuels, combustion, smoke, heat transmission, boilers, furnaces, fireplaces and bridges, firing methods, draught, boilerhouse instruments, feed water, boiler auxiliaries, steam generation, and boiler efficiency.

The preliminary grade course is based on 50 hours' instruction spread over one term; the intermediate course covers 100 hours in two terms; and the advanced course takes two years.

Firms who are willing to provide facilities for employees to attend such courses, or who offer practical training facilities in their boilerhouses, are asked to communicate with the secretary of the Regional Fuel Efficiency Committee of the Ministry of Fuel and Power, who will be able to supply details of the facilities available in the Region. Everything will be done to provide courses of instruction where sufficient demand is shown.

The Ministry states that an efficient stoker can save as much coal as a miner can produce; and that no matter how modern the steam-raising plant of a factory or workshop may be, it cannot give the best results unless it is controlled by men who are fully trained in boilerhouse practice and have some knowledge of the theory of combustion.

World Food Proposals

The Government of the United States at the Copenhagen Conference of the Food and Agriculture Organisation last September firmly supported the twin objectives of Sir John Orr's World Food Board proposals of raising the diets of all nations to a health standard and of stabilising agricultural prices at levels fair alike to both producers and consumers.

Sir John's specific proposal for a World Food Board was not considered at Copenhagen. Instead, it was unanimously agreed to refer the whole question to a 17-nation Preparatory Commission which met in Washington from October 28 to January 24. Its final recommendations, as made public on January 24, contained little of the machinery of the original proposals of Sir John's. But the twin objectives of the proposals were retained in the final recommendation.

The original Orr proposals called for an internationally managed and internationally financed World Food Board. It would have bought and sold exportable surpluses at agreed minimum and maximum prices, thus providing a buffer-stock against fluctuation in price and supply. Excess supplies under the Orr plan were to be sold cheaply to feed chronically malnourished people. FAO would work with such nations and with other international agencies to build producing and buying power so as to remove the underlying causes of poor diets.

The basic difference between this plan and the final recommendation is that each nation holds its own reserves and finances its own operations. It provides for a co-ordinated system of nationally managed and nationally financed buffer stocks of individual commodities. The Orr proposal, on the other hand, envisaged an internationally managed and internationally financed World Food Board operating in many commodities.

The two main advantages of the final recommendation over the Orr Plan are, firstly, less expense, and secondly, more adequate control over production.

A British Institute of Baking

The urgent need for a national school of baking in this country was one of the reasons prompting the proposal for the establishment of a British Institute of Baking, which was put forward by Mr. J. H. Beale, M.B.E., chairman of the Education Committee of the London Federation of Master Bakers, at their first meeting of the New Year.

Mr. Beale stressed the need also for premises for the new British Baking Industries Research Association, and the existing lack of a hall for the Worshipful Company of Bakers—both of which could be housed if his plan for a British Institute were finally adopted.

Although the cost of such a project would be in the region of a quarter of a million pounds, he did not think the figure fantastic. The Research Association alone had a fund of £30,000, and an estimated income of from £20,000 to £30,000 a year. The baking industry was the seventh most important one in the country, with sales of over £200,000,000 per annum.

"I realise that there are plenty of difficulties," concluded Mr. Beale, "but old trade jealousies would have to be put aside, and the proposal would have to be treated on bold and imaginative lines. I think that if we want this Institute, we can get it within a measurable number of years."

Cookery by Electronics

Commercial cookery by electronics has made its debut in London. One of the first firms to adopt the process is Messrs. Forte's who plan to install such plants at all their London establishments.

A demonstration of electronic cookery was held recently at their headquarters in London. On a 300 watt plant, manufactured in Birmingham, steaks were perfectly cooked in two minutes, sausages in one minute, and Welsh rarebit in seconds.

The plant, which costs £170, takes current from the electricity mains at 50 cycles, converts it into 20 megacycles, and uses the principle of wireless broadcasting to cook the products by means of short electronic waves. These rays set up molecular activity within the product, thus generating heat, and the food cooks from the centre outwards with remarkable rapidity.

No crust forms on the exterior of the products cooked, and no heat or smell from the cooking is noticeable even when standing close to the oven.

At the demonstration cheese was cooked between pieces of toast (cooked previously) and between cream crackers. In each case the cheese came out of the oven sizzling, but there was no change in the toast or the biscuits.

Forte's are still conducting extensive experiments in electronic cookery and do not yet recommend the process for boiling. They believe, however, that the heat treatment of milk and of ice cream mix should be possible by the process, though experiments have not as yet been carried out in these directions.

The 300 watt plant consumes one unit of electricity per hour, and total operating costs, including repairs, are estimated at 2d. an hour.

It is probable that as electronic cookery becomes more general the prices of the plants will fall, and that it will ultimately be used for domestic as well as for commercial purposes.

Manganese Deficiency in Crops

The time is coming when farmers and fruit growers will pay as much attention to "balanced spraying" of the trace elements as they do to "fertiliser mixtures" in order to produce larger and better crops.

This is the opinion of Dr. W. A. Roach, whose article "Mineral Deficiencies in Agricultural and Horticultural Crops," published in the 1945 Report of the East Malling Research Station, summarises the conclusions drawn from four years' experimental work. Much of this work was carried out on freshly ploughed pastures in the marshlands of South Kent. As this land produces some of the richest grazing in the world, it could reasonably be expected to be unusually fertile.

However, a table shows widespread symptoms of manganese deficiency, and the effect of spraying with manganese sulphate solution on the yield of various crops. Even on such fertile soil, the financial value of the increase exceeds the cost of treatment.

Other experiments showed that increases of approximately 10 cwt. of wheat grain per acre were obtained by spraying crops showing no characteristics of mineral deficiencies, the deficiency being diagnosed by plant analysis and plant injection.

Flesh and Fowl

Whale meat, promised for the market and claimed on the one hand to equal prime steak and on the other to be free from "fishy" taste, is but one of the several recent instances seeking to test the old saying that "new meat begets new appetite." Unlike those reindeer at the Zoo which must have a certain moss on the menu or pine away, man is ever out to experiment where flesh-eating is concerned. At a Hereford "fox supper," where a literal translation was given to "he who would taken chicken must eat fox," the verdict was "a rich dish, to be taken sparingly." Our forces have sampled all manner of meat from whale, seal and bear to dehydrated goat. Yet many are old ideas, repetitions of feasts of the past. Eighty years ago "kangaroo steamer" was tried at a dinner of the Acclimatisation Society. Earlier than that the porpoise appeared on banqueting tables, while a Dean Buckland of Westminster experimented with tortoise, alligator, and ostrich. And to mention ostrich recalls that fowl as well as beast has brought variety to the search for something new. From the 14th century Archbishop of York's banquet with 100 peacocks served, to Russian festive experiments with emu, and to rooks sold in London as "black pigeons," the list goes on. Cormorants from the Scottish coast selling at 5s. to 6s. each in London was a recent effort "off the ration." Cormorants for coupons would have been another story!

Britain's Macaroni Industry

ERIC QUINEY.

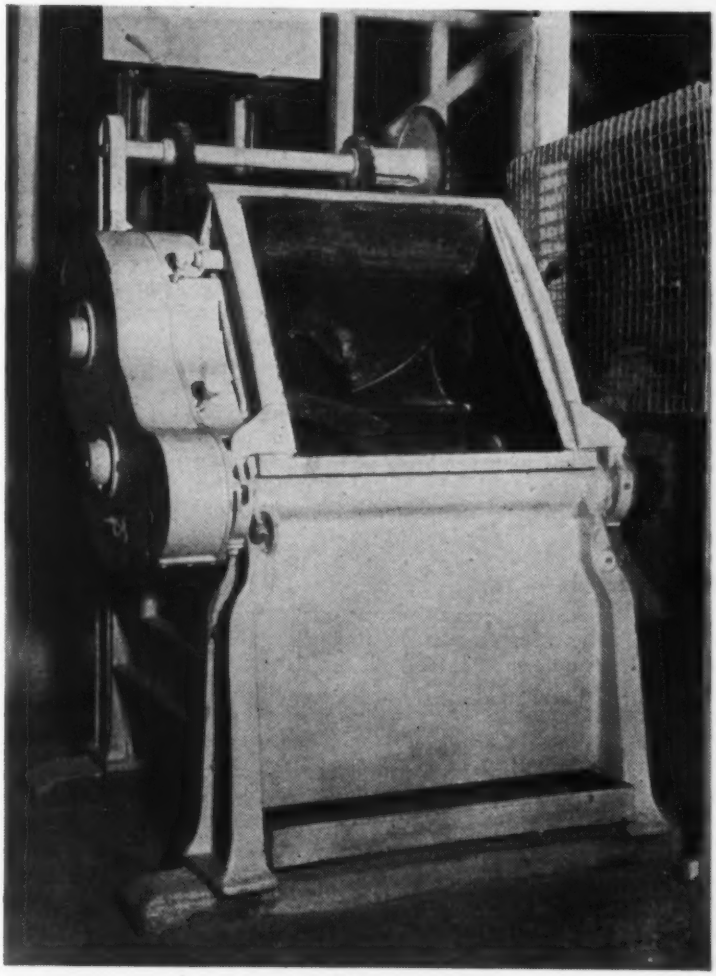
The macaroni and spaghetti industry in this country deserves recognition for the part it has played in feeding the people during the war and of developing the present-day production to approximately 600 per cent. greater than in pre-war years. Apart from the two or three pre-war manufacturers, this new, growing industry is made up of over 35 manufacturers with a consumption of something over 28,000-30,000 tons per annum, as against a pre-war consumption of 5,000-6,000 tons per annum.

THE need for feeding the people of this island with as varied a diet as possible created an incentive to food manufacturers. They were faced with the problem of securing plant and equipment for the manufacture of a large annual tonnage of macaroni and spaghetti. This was in the early part of the war years, when the acquirement of new plant was almost as impossible as the maintenance of pre-war equipment.

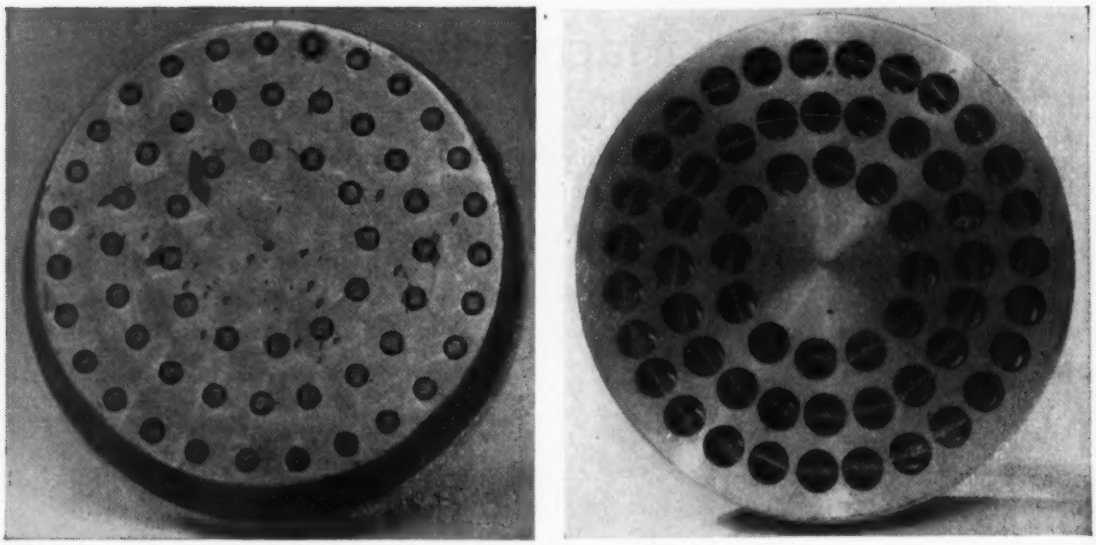
Macaroni and spaghetti rejoice in the name of alimentary pastes, and formerly were eaten by infants and others of weak digestion. Nowadays they form a versatile portion of our diet and are generally used in making a sweet or dessert. They are, however, much more appetising as a savoury, and there is a good deal of work to be done by the macaroni industry to educate the public to use these products to make either an *entrée* or a complete dinner.

Packaging Standards

The Ministry of Food have quite recently allowed macaroni manufacturers to pack their products into ½ lb. and 1 lb. containers, and this will provide the consuming public with an opportunity to purchase a consistently good quality macaroni under a proprietary pack and, at the same time, create an incentive to pack these products in such a manner that the public will be encouraged to



After sifting as a cleaning process the semolina is mixed with water at a controlled temperature in the dough mixer.



The front plate of the extruder consists of a die through the openings of which the dough is extruded. This die produces the different shapes and sizes of macaroni and spaghetti. The illustrations show the front and back views of the die.

make more frequent use of macaroni. For example, cartons can be printed with photographic reproductions in actual colour of a macaroni dinner or by printing various forms of recipes on the carton. It is a beginning to the education of the public in the wide use of these products, and it can be assumed that the industry as a whole will tackle this problem even more energetically when pre-packed macaroni has replaced the trade for bulk goods. It is argued that manufacturers will give far more time and attention to the quality of macaroni when they can make their sales under their own pre-packed brands.

Raw Materials

Apart from the process of manufacture, raw material plays a large part in producing a high standard of quality. It should be remembered that existing manufacturers are obliged to use varying grades of semolina for the manufacture of these products, but as the grain situation improves, the industry will have a better opportunity to select the type of semolina most suited to its plant, in order to produce a quality comparable with its pre-war Continental competitors, and for this purpose many manufacturers will wish to obtain a hard Durum semolina. Notwithstanding the unfavourable raw material situation, there are many manufacturers producing an excellent quality of macaroni.

Like many operations in the food industry, the manufacture of alimentary pastes appears on the surface a simple process, but it is fraught with all kinds of difficulties of a technical nature, built up around the changes that take place in the raw material as it passes from one process to another.

Preparing the Mix

The semolina is first sifted as a cleaning process and then mixed with water at a controlled temperature in a dough mixer, the quantity of water added being normally between 25 per cent. to 30 per cent. of the weight of semolina.

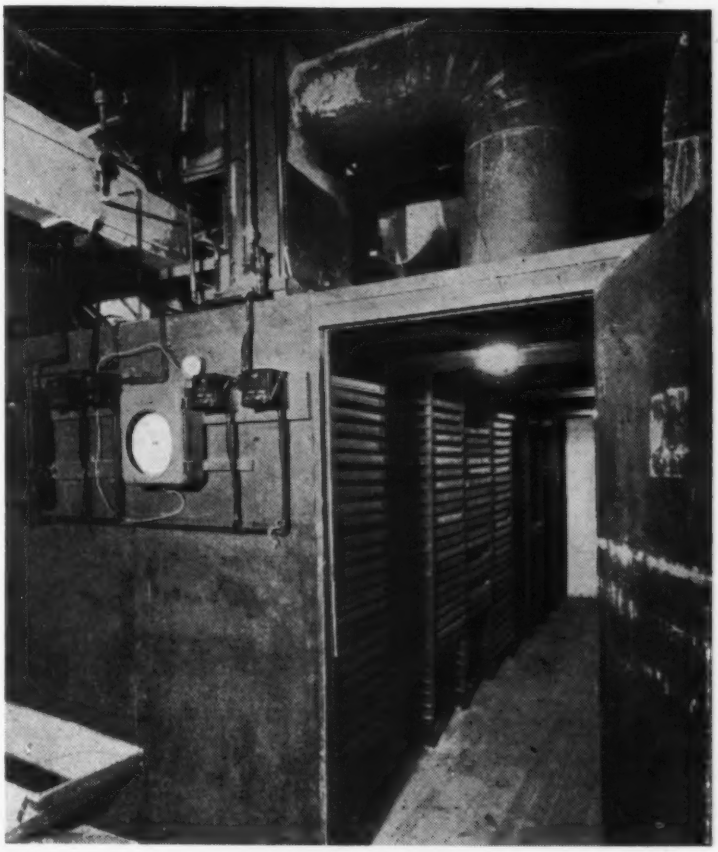
After this preparation the dough is automatically fed into moulding machines known as extruders and the dough is automatically fed through a hopper into a worm screw, which forces it along a barrel against the front plate of the machine, and produces a high pressure in the region of 3,000 lb. per square inch. Special care is taken to maintain these machines at a uniform temperature at a level which ensures that the dough mass remains plastic. If a uniform temperature is not maintained there is a variation in the rate of extrusion of the dough from the die, and undue fluctuations in temperature would also affect adversely the colour and surface glaze of the finished product.

The front plate of the extruder consists of a die, through the openings of which the dough is extruded. This die produces the different shapes and sizes of macaroni and spaghetti, and in the case of macaroni there is a modification in the die to produce the central holes in the product. This modification consists of a pin mounted axially in the

hole and situated at the back of the die, and while the dough paste is divided on passing the pin supports, it is re-united again to produce a homogeneous tube. As the tubes of dough in a stiff plastic condition extrude from the die, a revolving knife is mounted axially on the face of the die and this cuts off the macaroni, the desired length being obtained by adjustment of the speed of the knife. Similarly, spaghetti of any desired length can be obtained. The bore and the worm of the extruding machine and all the dies themselves are usually made of gun metal or phosphor bronze.

Drying Process

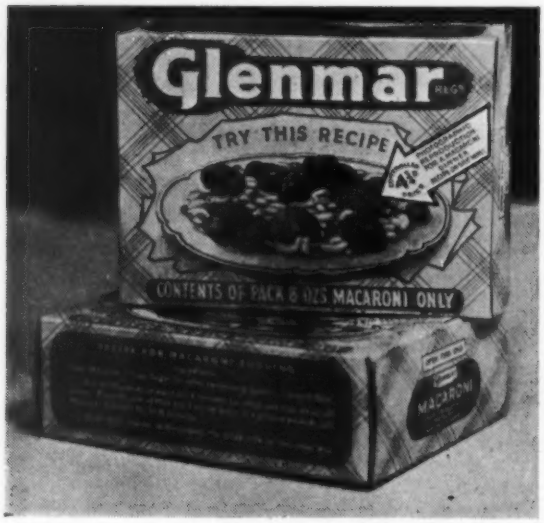
Perhaps the most difficult part in the manufacture of alimentary pastes comes after extrusion. The cut macaroni or spaghetti is conveyed either on wire trays or on a wire brattice conveyor to drying-rooms. The process of drying is a matter of controversy among many of the experts, and while it is generally believed that these products cannot be "cured" in less than forty-eight hours in the drying-rooms, the time taken varies considerably according to



Outer shell of the macaroni drying rooms.

Inside the drying room.

Weighing and packing operations are carried out automatically.



The permission to pack products into ½ lb. and 1 lb. containers will create an incentive to pack these products in such a manner that the public will be encouraged to make more frequent use of macaroni. This illustration is an example of cartons printed with photographic reproductions in actual colour of a macaroni dinner and also of various recipes.

the type of drier in use and the number of operations which go to make up the curing process.

The problem is to ensure that these alimentary pastes do not crumble or crack and are dried so as to produce a good hard physical structure and is not purely one of drying a given amount of moisture out of a given quantity of material; if it were, the time taken to dry the product would merely be an engineering proposition.

One method of drying is to form a hard crust on the outside of the material when the macaroni first enters the drying-room; it must then be left to sweat before it goes into its second stage, thus allowing the moisture remaining in the macaroni to be evenly redistributed.

The second process of drying takes a much longer time as the moisture has to be dried from the inside, outwards, and thereafter the material is left to sweat before it goes through its third process, so that there are alternative periods of "sweating" and "drying" until the final process of drying is completed.

The success of curing these products is dependent upon the control of the temperature and humidity of the warm air used for drying in each stage of the curing process. In some drying-rooms

(*Concluded on page* 175)

Detergency in the Food Industries

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Part I

In this series of articles will be discussed the underlying principles of detergency and sterilisation and the nature of the advances which have been made in the past few years in the chemicals used for these purposes.

RESEARCH work has been carried out in many different laboratories both in this country and the United States, with a view to elucidating the more fundamental principles which affect the efficiency of cleaning processes, while other laboratories, working from a more practical angle, have produced new compounds and mixtures which are advances on those previously used.

Types of Detergency Operations

In any food processing or production establishment there are at least two, and sometimes four, main sections into which cleaning and sterilising falls:

1. *Environment.*—This includes walls, floors, tables, benches; the general factory structure, and fittings.

2. *Processing plant and equipment.*—It would be obviously too great a task to enumerate the different items of processing plant which might be met in a tour of British food factories, and it would not be particularly relevant to these articles to attempt to do so. The important point is rather the materials of which these are constructed since these have a great bearing on the selection of the proper detergent.

3. *Cleaning of returnable containers.*—The shortage of containers has caused many manufacturers to take up the recovery of jars and bottles which in pre-war days were generally regarded as non-returnable. The washing of these sometimes involves special treatment.

4. *Cleaning of cans after cooking.*—The washing of food cans after retorting, before labelling and despatch.

The Choice of a Detergent

There are five primary factors to be considered which may be said to determine the selection of a detergent for any particular cleaning operation:

1. The nature of the deposit to be removed.
2. The material composing the surface to be cleaned.
3. The method to be used, *i.e.* whether hand washing, soaking, or machine washing.
4. The chemical nature of the water to be used.
5. Bacteriological considerations.

The considerations raised by these factors are of great importance and disregard of any one of them will lead to poor cleaning, damage to plant, and perhaps inconvenience or injury to the operators.

The Nature of the Deposit

Obviously a knowledge of the chemical and physical characteristics of the deposit is essential, and the following questions should be answered if the best results are to be obtained:

(*a*) Is the deposit mainly solid or liquid?
(*b*) If solid, hard or soft? If liquid, thin or viscous?
(*c*) Is it to any degree soluble in hot water?
(*d*) Does it contain oils or fats of any kind?
(*e*) Is it wholly or partly soluble in alkalis?

From this brief survey of its properties it will be possible to decide whether a powerful, strongly alkaline detergent is required or a mildly alkaline one, or one with particularly high wetting and emulsifying powers.

Cleansing Operation

The surface to be cleaned may be glass, vitreous enamel, cast iron, mild steel, stainless steel, tinned steel, tinned copper, aluminium, or wood. The detergent selected must not be injurious to the surface and should be chemically inert with respect to it. This is often a source of difficulty, because a deposit may require a powerful detergent for its efficient and rapid removal which, however, will attack the surface from which it must be removed. This has led to the investigation of the possibility of inhibiting such action by adding appropriate substances to the detergents in question. A further point occurs in this connexion: the different substances have differing powers of attraction for deposits, particularly the oils, fats, and greases which occur almost universally in the food industries.

This is further complicated by the condition of the surface, whether it is highly polished, smooth, roughened, or cracked.

If the cleaning operation is to be carried out by hand with the assistance of brushes, it is obvious that powerful detergents will not be necessary, because the removal of the deposit will be very largely a function of mechanical action and not be wholly dependent upon the powers of the detergent. In this case one of the milder classes of detergents would be indicated in order to avoid injury to the hands of the operators. In the case of a soaking treatment, or of the circulation of detergent solution through plant by means of pumps in the system, the whole range of detergents is open for use, and the choice will be decided by the considerations of the surface of the material and to a smaller extent to the chemical nature of the water to be used. Where a washing machine is to be used as in the washing of reclaimed or returnable containers (*e.g.* glass bottles or food paste pots), if this is an all-soaking machine the whole range of detergents is possible, apart from considerations of the water-factor, since glass is the least sensitive to the chemical constituents of detergents. If the machines are soaking-hydro or simply hydro (*i.e.* jetting) types great consideration must be paid to the prevention of excessive foaming, and a detergent selected which will give the best cleaning without that extremely annoying complication.

Composition of Water

The nature of the water is very important. In many districts it is extremely hard—between 35 and 40 parts per 100,000 total hardness. Very frequently factories have their own artesian wells, so that it often happens that quite hard water is being used in a factory which is located in a soft (mains) water district. For all purposes of detergency, the softer the water the better, and where the water is hard it can be softened by the factory using it. If this is done and the softening process properly regulated, no further attention need be paid to this point, but if a water-softening system is not installed the detergent used should incorporate water-softening salts, such as pyro- or poly- phosphates. This is particularly important in the case of washing machines, such as bottle-washing machines, where inattention to this point will cause scaling up and a consequent reduction in efficiency.

It is desirable here to point out that water-softening and scale-prevention are not quite the same thing and that it is possible to have the former without the latter. This will be discussed in more detail later.

Bacteriological Considerations

The purpose of detergency in the food industry is to destroy unwanted micro-organisms, and the degree to which this factor must be considered in any cleaning operation must have a bearing on the choice of a detergent. For processing plant where a high temperature is used (anything over 240° F.), the problem solves itself, but for other plant where only ordinary temperatures prevail special care has to be taken. Yeasts are, in many branches of the food industry, as great a nuisance as bacteria without constituting a menace to the health of the consumer, and are often much more difficult to destroy. It may be possible to carry out with the detergency operation a degree of sterilisation sufficiently great to satisfy the standards laid down for that particular vessel or piece of plant. If the nature and use of the detergent prevent this, it may be necessary to have a separate sterilising operation which may be carried out either with steam or sodium hypochloride solution. In the rare cases where the use of both steam and sodium hypochlorite solution are impracticable other means are now available to achieve the destruction of micro-organisms.

Chemical Compounds

At this stage a review of the main chemicals used in detergent preparations will be useful. It will lend point to some of the observations in the immediately preceding sections and render more easy to understand the subsequent discussion of fundamental principles.

In modern chemical literature the term "detergent" is usually taken to mean a synthetic organic compound which has wetting, dispensing, and emulsifying properties. The word has thus been considerably narrowed in meaning because in its wider sense—and that is the sense in which the term is used here—it means any substance which effects, or assists in, cleaning. Thus, from early times common simple substances have been used as cleansing agents, and some of these are still incorporated in the modern balanced detergent. Developments in the last few decades have replaced the simple, single detergent substance by more or less complex mixtures in which the various constituents are carefully balanced to give the desired result for any particular cleaning task. The knowledge which has led to the production of these highly efficient balanced detergents has very often been of a purely empirical nature: the result of trial, error, and experience, rather than of results predicted by scientific research. Nevertheless, the reasons for the power of these mixtures are now being elucidated by means of methods and instru-

ments which modern research has placed at the disposal of the detergent chemist and physicist.

The compounds which occur in modern detergents are listed below with a brief note on their chemical and detergency characteristics.

Caustic Soda.—NaOH. A strong concentrated alkali, very useful in a detergent for saponification of fats, but only moderately good as an emulsifying agent when there are no fats to saponify. It should be mentioned that when fats are present they can be saponified by strongly alkaline solutions, the fatty acid part of the fat molecules making a sodium salt which is a soap. Soaps reduce the surface tension of the solution and aid the emulsifying properties of the detergent. The extent to which saponification of fats will take place will depend on the concentration of caustic soda and the temperature of the solution; the hydrolysis of less than ½ per cent. of the total fat present will markedly affect the properties of the solution. The production of soap will, however, tend to produce foam in the detergent solution. This is a disadvantage in spray-type washing machines.

Caustic soda is injurious to the skin and care should be taken with detergent solutions which contain it. This compound is difficult to rinse off after the cleaning process is finished, and because of the ease with which it attacks tin and aluminium is only mixed cautiously in plant-cleaning detergents. It is wholly titratable to the phenolphthalein end point.

Sodium Metasilicate.—$Na_2SiO_3.5H_2O$. Highly alkaline but considerably less so than caustic soda. Imparts powerful emulsifying properties and good rinsing qualities to the detergent solution. Needs to be limited in a detergent because of its ability to form adsorbed silica films on metal surfaces. It is wholly titratable to phenolphthalein.

Sodium Orthosilicate.—Na_4SiO_4. Combines the more desirable properties of both sodium metasilicate and caustic soda. A highly alkaline substance which often forms a valuable constituent of strongly alkaline detergents.

Tri-sodium Phosphate.—Na_3PO_4. Less strongly alkaline than the substances previously mentioned. Excellent for rinsing and assists in preventing scale formation. The first sodium atom can be titrated to the phenolphthalein end point (*i.e.* contributes to caustic alkalinity), the second sodium atom titrates to the methyl orange end point (carbonate alkalinity), while the remaining sodium atom is not alkaline.

Sodium Carbonate.—Na_2CO_3. Sometimes called soda ash when in the anhydrous form. Generally useful in detergents, having in a minor degree some of the properties of the foregoing chemicals. Half titrates to phenolphthalein and half to methyl orange. The hydrated form of this material $Na_2CO_3.10H_2O$ is known as washing soda.

Liquid Silicates.—These are liquids in which the silica forms complexes with caustic soda so that there is more silica than caustic soda. This is usually indicated by giving the Na_2O to SiO_2 ratio, which varies from 1:1·5 to 1:4. They do not crystallise, but if dried become glassy. Used in liquid detergents and are only mildly alkaline. Their solutions show marked reductions of surface tension, and they are among the most powerful emulsifying solutions known. They are also used in some gel detergents.

Sodium Hexametaphosphate.—$(NaPO_3)_6$. Has the important property of preventing the deposition of lime from hard waters, or making the deposition so slow that the salts are brought down in an amorphous and non-scaling form. Will gradually hydrolyse in an alkaline solution to tri-sodium phosphate. This substance is neutral in reaction, and excellent for increasing rinsibility of detergents.

Sodium Chloride.—NaCl. Usually added in very small quantities to assist in the reduction of surface tension.

Wetting Agents.—These are of many types. All have a lengthy organic chain and a soluble group. Sulphated fatty alcohols are a common group of this class, an example is sodium lauryl sulphate ($C_{12}H_{25}O.SO_2ONa$). They reduce the surface tension of water from 72 dynes per cm. to 25 dynes per cm. and are very good for assisting in emulsification and dispersion. When solutions containing them are subjected to aeration or mechanical agitation considerable quantities of foam are produced. Therefore, these substances cannot be used in washing machines operating wholly or partly on the jetting or hydro principle. They are neutral in reaction and commercially they contain quantities of sodium sulphate.

Starch.—This substance is used in the manufacture of gel detergents which use the colloidal principle of cleaning. Colloidal detergent solutions have high cleaning power and enable economies to be effected in the actual amounts of material employed.

Sodium Sulphite.—Na_2SO_3. This is used in alkaline detergents to prevent attack on tinned surfaces.

Sodium Dichromate.—$Na_2Cr_2O_7$. Added to some detergents. Helps to prevent the staining of brass.

Sodium Sulphate.—Na_2SO_4. Neutral. Sometimes used as a detergent assistant in mildly alkaline powders.

Sodium Sesqui-Carbonate.—$Na_2CO_3.NaHCO_3.2H_2O$. A weakly alkaline complex used in mildly alkaline detergents.

Aluminium Acetate.—Assists deflocculation.

There are other substances added in small quantities to proprietary detergents, but these are the subject of patents and will not be discussed here.

Radio Frequency Heating

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The heating of non-conducting materials, sterilisation, and elimination of larvae by the use of radio frequency currents are among the subjects touched upon in this article.

IT is possible to pass radio frequency currents through any conducting or non-conducting material that is placed between metal plates across which radio frequency potential is established by means of a suitable generator. These currents in turn will generate heat in the materials according to their characteristics. Most foodstuffs are readily heated by radio frequency currents, but two different materials placed simultaneously between electrodes will not necessarily heat at the same rate.

The advantage of this method is that heat is generated actually within the material and does not have to be conducted from the outside. It is therefore possible to raise the temperature of the material rapidly without establishing a heat gradient. The importance of this is immediately seen when the problem of heating a material that is damaged by high temperatures, but must be raised near to this temperature to produce a specific effect, is considered.

For example, to raise the whole of the quantity of 1 cwt. of flour above 58° C., the minimum lethal temperature for many fungi, will take six minutes, using a 10 kw. generator. Control of this heating is sufficiently exact for it to be possible to guarantee that no part of the flour will reach 65° C., the temperature at which there would be serious loss of strength.

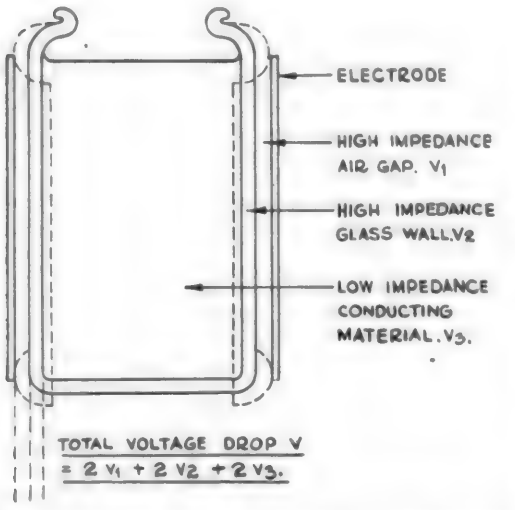

ELECTRODE
HIGH IMPEDANCE AIR GAP. V_1
HIGH IMPEDANCE GLASS WALL V_2
LOW IMPEDANCE CONDUCTING MATERIAL V_3.
TOTAL VOLTAGE DROP V
$= 2V_1 + 2V_2 + 2V_3$.

Fig 1.—Diagrammatic representation of sterilisation of the contents of a bottle between curved electrodes.

Sterilisation Methods

The sterilisation of products in glass bottles is a rather more difficult problem than would be supposed from first consideration of this heating method. If the cross-section of the bottle shown being heated between parallel curved electrodes in Fig. 1 is examined, it will be clear that any current that passes through the contents must also pass through the walls and a small air gap, which cannot be entirely eliminated.

If the contents of the bottle have a low specific resistance, as would be the case in a highly-salted meat product, then the current needed to raise the temperature in an economic time would require a very high voltage across the glass and air gap, through which the current would be carried capacitatively. The higher the frequency, the lower the voltage that would be required, but at frequencies at present available there is a danger that the breakdown voltage of the glass and air gap will be exceeded. If in the bottle there is a non-conductor like fat or flour, the material heats up readily with no danger to the bottle or its contents.

Pest Control

The elimination of eggs or larvae in dried fruit is readily accomplished since these organisms are quickly killed at temperatures that do no harm to the product. The fruit is charged into boxes, two sides of which are made of metal and the others of a mineral-filled ebonite. These boxes slide into a heating chamber where they are heated for three minutes, after which they are passed through a radiant heat tunnel where they are maintained at the required temperature for twelve minutes.

During this heating process the larvae will come

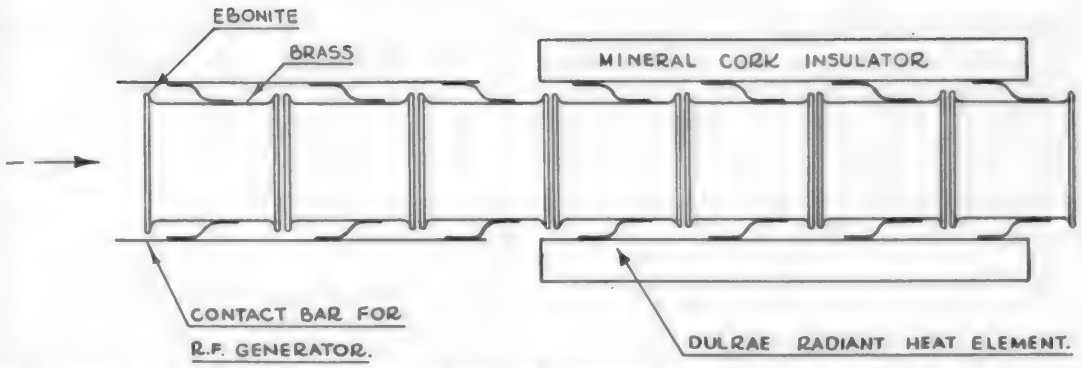


Fig. 2.—Plan view of continuous heating tunnel using radio frequency heating followed by infra-red.

out of the fruit in an effort to avoid over-heating. At the end of the operation the boxes are emptied across a sieve through which cold air is passing, thus lowering the temperature and separating any larvae that may have come out. (See Fig. 2.)

A similar system is used for the dextrinisation of starch and cereal products, in which case a higher temperature is required reducing the throughput of material for a given power of generator. In this connexion it will be appreciated that if the temperature exceeds 100° C., or if the material treated is allowed free access of moving air during the heating cycle, water will be evaporated, requiring additional electrical energy to supply the latent heat of vaporisation.

The question of the economics of drying by radio frequency heating is a complicated one as the initial cost of the plant, rate of depreciation, and upkeep charges have all to be considered. Allowing for these overhead charges and including valve replacement and the running cost of current, a rough estimate of threepence per kilowatt hour when current is available at a penny per unit is reasonably accurate. It will therefore be seen that heating a ton of grain to 60° C. will cost about five shillings. If it is also necessary to remove 12½ per cent. of water, the cost will increase to twenty-five shillings.

It is apparent that radio frequency heating is not economic for the bulk drying of grain unless electrical energy is available at a small fraction of a penny per unit.

The unit shown in Fig. 2 is also applicable to the baking of bread, except that the containers are made from metal and Mycalex or Pyrex instead of ebonite, and the tunnel is heated sufficiently by radiant heat and convection to give a very thin crust to the otherwise crustless loaf. The small-scale experiments on this work were carried out in the Redifon Screened Cage Work Unit and 1¼ kw. Redifon R.H. 12 Generator illustrated in Fig. 3.

The future of radio frequency heating in the catering side of the industry is undoubtedly bound up in the application of wavelengths of the order of 1 cm. This frequency nearly approaches infra-red, and the dissipation of energy by such waves in the form of heat is much less dependent on the electrical conductivity of the material.

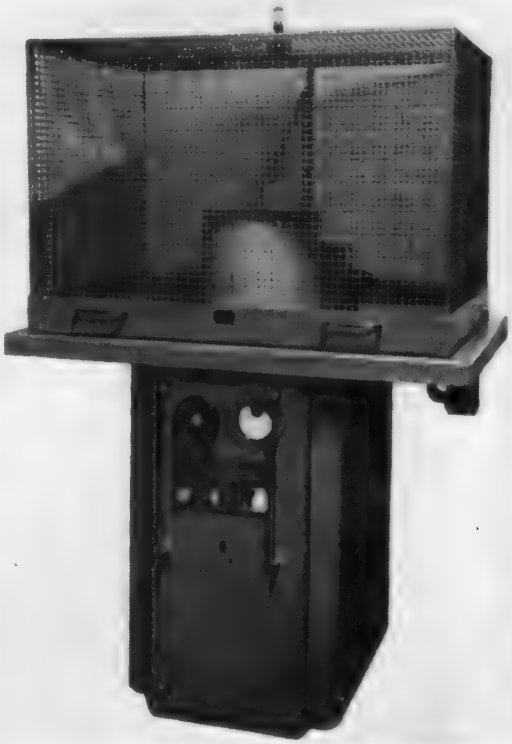


Fig. 3.—Screened cage work unit and generator.

Frozen peas are tested in the research kitchens of the Frozen Food Foundation by Dr. Donald K. Tressler (left) and Gerald A. Fitzgerald (right).

Microscopic slides are examined to determine the physical changes in the structure of food during the freezing process.

The Food of the Future

The rate at which the quick freezing of foods is progressing in the United States is exemplified by the fact that today there are no less than five hundred plants in that country freezing foods of various kinds, though the bulk of these operations is on a relatively small scale. Frozen meats, fish, baked goods, and prepared specialities represent a value to American industry of well over a billion pounds weight annually. Technically a frozen food, ice cream adds another two billion pounds to the total.

DESPITE the rapid percentage growth, average U.S. *per capita* consumption of frozen food is still very low. The figure for frozen fruits, for example, is 2·2 lb. *per capita* per annum; for frozen vegetables 1·44 lb. *per capita* per annum. Though still an infant industry, the tremendous growth of frozen foods point to almost limitless future possibilities if certain problems can be overcome.

It has been clear that the maximum potential of frozen foods will be gained only through mass consumption in homes, rather than purely through institutional use by hotels, restaurants, and the like. But so far, the great bulk of frozen food has been moving into outlets other than the home. For example, in 1944, only 7 per cent. of the frozen fruit pack was put up in retail sized containers (1 lb. and under); less than half the frozen vegetable pack moved to market in consumer sizes in the whole of the United States.

The major problems in connexion with mass consumption are:

1. Expansion of high-quality frozen food production.

2. Large-scale education of the consumer to recognise the nutritive value, convenience, and other benefits of frozen foods.

3. Provision of adequate storage facilities for frozen foods in the home, to lift retail purchases out of " 12 oz. package now-and-then " class.

4. Gearing America's distributive and transportation systems to handling products requiring temperatures of 0° F. and lower.

Early attempts to expand home use of frozen foods generally came to grief through lack of home storage equipment. Organisations " peddling " frozen food direct to homes found their operating margins more than submerged by excessive delivery costs; ambitious plans to expand retail store volume were hampered by sales which came in dribbles, rather than torrents.

Food and the Department Store

In 1943 one of America's leading students of department store merchandising saw that department stores, though major providers of most categories of goods used in the home, were practically out of the food picture.

Food is America's single biggest business, some 24 billion dollars being spent on the retail trade annually. Of this, about 250 million dollars are accounted for by frozen foods. With proper pro-

The laboratory staff serves the consumer taste panel with fresh, frozen, and canned forms of the same products.

This specially designed truck is used to deliver frozen foods to the home.

motion, adequate equipment, and sound distribution methods, this 250 million dollars had a potential growth to 10 or 11 billion dollars.

Factors which had prevented food from becoming a major department store activity—large requirements of high-cost store selling space, low profit margins on packaged foods, spoilages which attended unpackaged items—were overcome by frozen foods. These were admirably adapted to department store selling techniques.

Department store trade runs to 7 to 8 billion dollars a year. Capturing only a small part of the frozen food potential would produce a striking increase in these figures.

Spurred by these facts, an entirely new corporation, called Frozen Food Products Inc., was organised in the States in 1943 to explore and develop the essentials of an integrated department store frozen food merchandising plan, and pilot it to successful commercial operation.

Plans for Distribution

Following more than two years of very intensive work, the distribution plan, or "Frostmaster" system as it is termed, materialised into two activities:

1. An over-the-counter frozen food section in the department store itself, operating through specially developed selling methods and equipment.
2. A home-delivery frozen food service to customers having adequate frozen food storage space. This home-delivery service is operated out of off-premise distribution facilities located in low-rent neighbourhoods.

First physical appearance of the service was an over-counter frozen food business established in a section of Carrier Corporation's Syracuse plant. This activity was an excellent war-time proving ground for the over-counter selling theories.

Next came a pilot home-delivery operation, for which the construction of 240 "Frostmaster" home-storage cabinets was permitted.

Storage Cabinets

The effect of the pilot survey has been to confirm the original theories as to what would make a satisfactory kitchen storage cabinet for frozen foods. The "Frostmaster" unit is, in its present form, a top-opening cabinet, standing 36 in. high in order to be on a level with other kitchen work surfaces. It is 23 in. deep and about 30 in. in width.

The cabinet is designed to hold up to 120 lb. of frozen food, about two weeks' supply for the average family.

This unit is not primarily designed as a freezing cabinet. A small amount of freezing, however, can be done in it, and users take advantage of this feature.

Recognising that the future of frozen foods is dependent on high quality, a non-profit scientific, research, and service organisation was established known as Frozen Food Foundation Inc., to guide "Frostmaster" department stores in obtaining top grade products.

Formation of Research Institute

The Foundation was established in the spring of 1945 under the technical direction of Gerald A. Fitzgerald, who was associated with Clarence Birdseye in the 1920's when Birdseye was developing his now famous process. Research into nutrition, home economics, packaging, and bacteriology is carried on in the laboratories in Syracuse.

Their research programme includes the following major projects:

1. Formulation of frozen food quality standards, and co-operative work with packers to gain adherence to these standards.
2. Improvement of present staple frozen items, and development of new products which lend themselves to freezing.
3. Research into physical and chemical phenomena attending the freezing of prepared foods—such as causes of fat rancidity in frozen products during storage, and "curdling" of thickened products such as frozen soups and frozen chicken.
4. Improvement of plant equipment and processes through bacteriological research.
5. Basic research into the nutritive aspects of frozen foods, and application of these findings to improve processing, distribution, and home preparation methods.
6. Study of packaging materials and design, and, through co-operative work with packaging industries, the development of improved frozen food containers.
7. Preparation of recipes, menus, and defrosting methods.
8. Developing scientific background data for use by department store home economists, demonstrators, and sales personnel.

For the future, frozen foods hold definite promise of becoming major factors in the agricultural and nutritional field of the United States. Frozen foods also may radically change the pattern of food shopping and preparation for the American housewife.

TO AUTHORS

FOOD MANUFACTURE is prepared to consider the publication of any books on scientific and technical subjects which authors might care to submit.

Food Analysis

Progress in 1946

D. W. GROVER, B.Sc., F.R.I.C.

The application of analytical methods to food is described in this progress report, which carries on the subject from the date of the 1945 report published in FOOD MANUFACTURE, April, 1946.

SUBJECTS of general interest discussed during the past year, and having particular application to food analysis, include chromatography[1, 7] polarography,[2] and statistics (in application to food problems).[3] Chromatographic technique has been extended beyond the original conception of separation by differential adsorption upon some surface-active material. Partition chromatography, which has proved particularly successful in the separation of mixtures of amino acids[7] depends, as its name implies[9] upon the partition of the solute between two solvents. The solvents are saturated with respect to each other, one being absorbed on a suitable stationary support such as silica gel, cellulose, or starch while the other flows across the support. Separation of ionised solvents can be achieved by the use of columns of base exchange materials. Other improvements in technique include various methods for observing the separation of colourless substances and for using active carbon as adsorbent.

Some application of polarographic analysis to foodstuffs has been described. The procedure is particularly applicable where large numbers of routine analyses have to be performed on similar material. Apart from the determination of inorganic constituents greatest success appears to have been achieved in the estimation of ascorbic acid and amino acids.

At the moment the most interesting aspect of the application of statistics to food analysis is that raised by Steiner.[3] The problem dealt with is one with which the analyst makes almost daily acquaintance: to determine the composition of a manufactured food by analysis. Examples are the determination of the meat content of sausages, meat pastes, etc., and the fruit content of jams. From the observed variability of the raw materials limits of composition can be calculated with any desired degree of confidence. The subject is one which engenders lively discussion, particularly in its legal aspect, and further reference will be reserved until all points of view have been expressed.

The confidence which can be placed in this or any other method of assessing the composition of processed foods must depend on the quantity and quality of analytical data for the raw materials themselves. A useful extension to our knowledge would surely result if manufacturing concerns, analysts, and others having records of this kind would publish them, together with particulars of origin of sample and analytical methods.

DAIRY PRODUCE

The freezing point of **milk** is regarded as the most reliable laboratory indication of added water. Our knowledge of its variability and of the corrections made necessary when the milk sample is sour have been placed on a firmer basis during recent years. Mention has been made in previous years of some of the contributions to this field of knowledge, but the important report (1945) of a committee sitting under the general direction of the Department of Health for Scotland was overlooked.[4] This report confirms that 0·530° C. is the minimum acceptable freezing point depression, subject to the usual safeguard of an appeal to the cow. A correction when lactic acid has been produced by souring is given by the formula: Δ° C. (corrected) = Δ° C. (observed) − 0·34 (per cent. acid as lactic − 0·18). The standard resazurin dye-reduction test for the bacterial contamination of milk is known to be liable to failure in cold weather. Organisms present in unhygienically produced milk may fail to grow during the comparatively short period of the test and hence fail to reduce the dye. A standardised pre-incubation technique has been proposed[5] to overcome this difficulty, the conditions being as follows:

Mean Shade Temperature.	*Pre-incubation.*	*Resazurin Test.*
41°F.	24 hrs. at 16°C.	30 mins. at 37°C.
41-45°F.	,, ,, ,, ,,	10 ,, ,, ,,
46-50°F.	,, ,, ,, ,,	5 ,, ,, ,,
51-55°F.	None	60 ,, ,, ,,

The change in *p*H on standing provides a possible alternative test for keeping qualities.[6] A test based on this idea and involving the use of *p*H apparatus is claimed to be more convenient than the dye reduction test. Until a large amount of data is presented it is difficult to accept this claim. Clearly the apparatus needed is more elaborate and

Steam-heated water bath.

there is always the possibility that organisms may grow which do not produce lactic acid.

As a result of a careful study of the phosphatase test for incomplete pasteurisation Horwitz[15] has suggested a procedure modified in detail from earlier methods. The modified test is claimed to give excellent reproducibility and sensitivity. An extensive bibliography has been provided.

The resistance offered by **dried milk** to development of tallowy "off-flavours" is attributed in part to the anti-oxidative properties of sulphur-containing compounds produced on treating raw milk. Lea[8] describes an apparatus for determining these heat labile sulphur compounds in liquid milk. The milk is bubbled at 60° C. with nitrogen and the volatile sulphur compounds are collected and estimated colorimetrically. Another method for the colorimetric estimation of reducing groups in milk is based upon reduction of potassium ferricyanide and determination as ferric ferrocyanide[9] colorimetrically.

The use of formaldehyde as a preservative has been shown to lead to results for the routine determination of fat (Gerber method) as much as 0·15 per cent. low. The use of butyl alcohol as an alternative is recommended.[10]

Fisher's volumetric method for moisture determination has been successfully applied to a variety of dairy products—butter, dried and condensed milk, etc.—with a water content less than 20 per cent.[38]

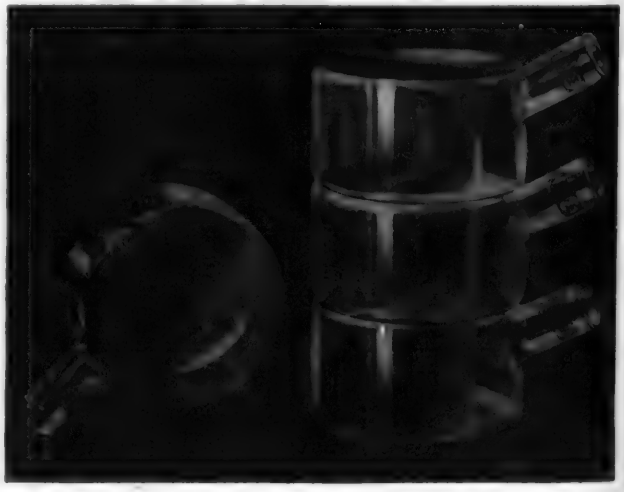
EGG PRODUCTS

For the rapid routine determination of fat in **dried egg powder** a modified Babcock test may be employed.[12] The centrifuge bottle used is the Paley bottle in which the graduated portion is off-centre and an opening is provided for introducing the sample. A rigid procedure laid down gives in most cases close agreement with accepted standard methods.

The acidity of an ether extract of egg powder (*A.O.A.C. Methods of Analysis*, 1940, 314) is not entirely due to free fatty acids. Some titratable acidity is contributed by cephalin, a component of the phosphatide complex of egg yolk. Moreover, at the *p*H of freshly dried egg (8·5 to 9·0) fatty acid extraction with ether is incomplete, complete extraction occurring only when the *p*H is in the neighbourhood of 4·5. These errors combined render the standard method unreliable, particularly for good quality powders of low acidity, and modifications have been proposed.[13, 14] The powder is extracted with acetone and the extracted cephalin precipitated with magnesium chloride. The acetone solution is diluted with water and extracted with ether. The free fatty acids are then estimated in the usual way.

FISH

One of the many objective tests which have been proposed for demonstration spoilage of fish is the determination of the quantity of trimethylamine in the material produced by protein breakdown. This may be achieved without appreciable interference by other amino compounds by a method due to the Fisheries Research Board (Canada).[11] An aqueous extract of fish muscle is extracted with toluene and the dried toluene extract reacted with



Culture flasks.

0·02 per cent. picric acid in toluene. Trimethylamine gives a yellow colour which may be measured in any convenient manner.

FATS AND OILS

It has been observed in the past that the determination of peroxide value is affected by the action of atmospheric oxygen. This applies particularly to the thiocyanate method of Chapman and McFarlane. Lea has made an exhaustive study of the effects of this and other factors on the peroxide value measured iodometrically, and has proposed two modified standard methods which appear to eliminate any sources of error present in earlier methods.[16] The factors investigated included dissolved oxygen, moisture in reagents, time and temperature of reaction, and quantity of fat taken. The higher peroxide values obtained when smaller quantities of fat are used for the determination are not due to reaction of excess of iodine with the fat present, as was previously supposed, but to the relatively greater effect of free oxygen under these conditions. When, therefore, deaeration and similar precautions are omitted, the lower value obtained with the higher amount of fat is more likely to be the correct one. There is no evidence of combination of free iodine with the fat present. Of the two new methods proposed one involves reaction for one hour at room temperature and the other for two minutes at 77° C.

The double-indicator method for determining the saponification value of fats and oils using methyl red and bromo-phenol blue has been adapted for the employment of 5, 50, and 500 mg. quantities of sample. The procedure using 500 mg. is preferred, and is considered superior to the usual scale of working owing to the saving of time and reagents.[17]

Penicillin purification apparatus.

SUGARS AND STARCH

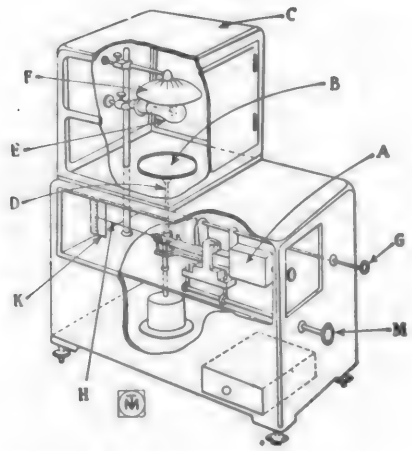
The titration of Fehling's solution with **reducing sugars** can be troublesome in the presence of highly coloured substances, and an electrical method of detecting the end point should prove useful in such circumstances.[18] The principle is to observe the current passing between two bare copper electrodes inserted into the reaction mixture and impressed with an e.m.f. of about 10 mv. At the end point excess of reducing sugar polarises one electrode and stops the current.

A further contribution to the **analysis of sugar mixtures** has been described. It is intended for lactose syrups containing both dextrose and galactose.[19] The two hexoses are determined by means of Barfoed's reagent (*Z. Physiol. Chem.*, 1930, **188**, 219) and the lactose after fermentation. De Whalley and Grey[20] have given a warning against the use of impure methylene blue in making an estimation of invert sugar in refined sugar by their method.

The Fisher's volumetric method of **water determination** has been applied to a variety of sugar-house products.[39] The results obtained do not have the precision of the refractometer when used for the examination of pure sugar solutions. For more complex materials where the refractometer is not applicable the results are sufficiently accurate for routine analysis.

FRUIT AND VEGETABLES

The effectiveness of the blanching process, an essential step in the production of many **dried or frozen vegetables,** is commonly gauged by methods based upon measurement of undestroyed enzymes. The destruction of peroxidase is claimed[21] to be a better index of effective blanching than that of catalase, the latter enzyme being more heat sensitive than those resulting in flavour deterioration. In testing for peroxidase activity correct chemicals and substrate conditions are essential, and in general guaiacol is preferred to other reagents. Complete destruction of peroxidase is not essential in all cases. A critical review of this subject including an extensive bibliography published by Joslyn[21] should be read by all interested in this problem. A modification of the peroxidase test



Sectional diagram of moisture tester.

makes use of colour standards prepared from cobalt nitrate and potassium bichromate. The test is made on an aqueous extract of the sample.[22]

The use of new spray materials for the control of **diseases and insect pests** in fruit and vegetable culture has necessitated development of new tests for spray residue. DDT is washed from fruit or vegetable samples with a solvent (*e.g.* pentane or benzene) and an aliquot evaporated, reacted with metallic sodium, and the chlorine ion determined in the usual way.[23] Fermate (ferric dimethyl dithiocarbamate) is washed from the fruit, decomposed with hot acid, and the liberated carbon bisulphite determined by reaction with a copper salt and diethylamine.[24]

FLAVOURS AND PRESERVATIVES

Several methods for the **rapid determination of alcoholic constituents** in essential oils have been described in recent years. They are invariably based upon the addition of a known amount of some esterifying reagent to the sample and, after completion of the reaction under standard conditions, estimations of excess reagent. A method of this type for the determination of menthol in peppermint oil[25] involves reaction in the cold with an acetic anhydride/pyridine solution. Good agreement with U.S.P. methods is claimed.

Saccharin may be estimated in quantities up to 10 mg. by reaction with aqueous solutions of α-naphthylamine (0·1 per cent.), copper sulphate (10 per cent.), and dilute ammonia. The dark violet precipitate is extracted with chloroform and measured colorimetrically.[26]

Two reactions for ***p*-chlorobenzoic acid** have been described. For one of these[27] the extracted preservative is nitrated with mixed nitric and sulphuric acids and coupled with diphenylamine followed by reaction with hydrochloric acid and caustic soda. The blue colour is not interfered with by benzoic or salicylic acids but cinnamic acid should be removed. The other[28] relies on the characteristic red colour produced by action of caustic soda after nitration. Benzoic, salicylic, and *p*-hydroxy benzoic acids give a yellow colour.

Monochloracetic acid reacts with excess of pyridine to give betaine hydrochloride which may be collected, weighed, and identified (by melting point). This reaction may be employed for the **determination of the preservative,** separated from the acidified sample by ether extraction.[29] The reaction is not stoichiometric, and a standard curve is required for accurate results. Similar precipitates are given by bromacetic acid, etc. Bromine-containing preservatives may be detected after decomposition with alcoholic potash and liberation of the bromine with acid and potassium permanganate. The free bromine is indicated with fluorescein paper.[30]

A selective colour reaction for **boric acid** is described as follows:[31] "one or two drops of 0·01 to 0·10 alcoholic turmeric solution and several drops of alcohol are added to a small amount of the sample. A trace of the solid salicylic acid and a drop of 1 : 10 hydrochloric acid are added, the mixture stirred and evaporated to dryness. A red residue, soluble in alcohol to give an eosein-red colour changing to cornflour blue with ammonia indicates boric acid."

TRACE ELEMENTS

Details of several modifications of established methods for determining trace elements, including metals, have been published during 1946. A novel method for **fluorine estimation,** described by Ovenston and Parker,[32] is adaptable to use with an absorptiometer. It is suitable for 0·1 per cent. or more of fluorine in organic material, and is based upon the colour reduction produced in peroxidised titanium solution. The alazarin-S thorium nitrate titration method has been extended to deal with microgram quantities.[33] Adjustment of acid and salt concentrations gives increased sensitivity combined with reduced interference by other anions.

Traces of **copper** which have an important bearing on antoxidation of fats, etc., may be advantageously collected from fluids, *e.g.* milk, by passing the sample, after treatment with perchloric acid through a base exchange resin. The perchloric acid at *p*H 1 precipitates proteins and brings the copper into solution. The column is washed, stripped with hydrochloric acid, and the copper

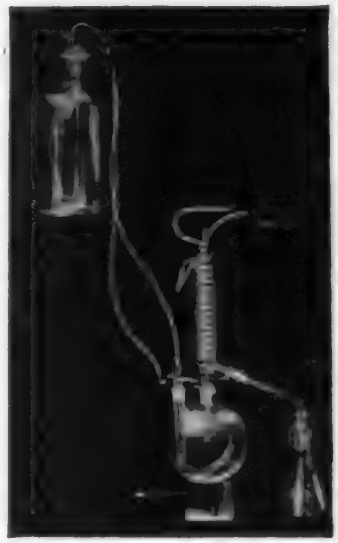
determined in any convenient manner.[34] A rapid system of **analysis of gelatin** for arsenic, iron, copper, and zinc determination due to Steigmann[35] should prove of considerable value for routine tests, standard methods being somewhat laborious. Arsenic is determined by a modified Gutzeit test, iron and copper by their accelerating action on the oxidation of phenyl *p*-phenylamine diamine with hydrogen peroxide in acid and alkaline media respectively, and zinc by direct dithizone reaction with the gelatin solution in the presence of acetic acid. Another scheme for the estimation of traces of **metals** makes use of established **colour reactions** suitable for measurement in an absorptiometer (Spekker).[36] The sample is decomposed with sulphuric, nitric, and perchloric acids and minute traces of arsenic, copper, lead, zinc, iron, and certain other metals can be estimated. Rogers and Heron[37] have described some improvements to the Milton and Duffield arsenomolybdate method for arsenic (*Analyst*, 1942, **67**, 279), making use of an electrolytic cell for reduction of pentavalent arsenic and its evolution as arsine. The B.P. method for lead has proved unsuitable for the analysis of *creta preparata* and modifications have been proposed.[51]

MISCELLANEOUS FOOD PRODUCTS

Nut-milk chocolate is a complex mixture whose exact analysis is not easy to achieve. One procedure involves estimation of cacao (from alkaloids and colouring matter) and milk solids (from casein, phosphorus, and butter fat). The nut content is arrived at by difference.[40] Cocoa shell has certain valuable features as an animal feeding stuff, its alkaloid content being a limiting factor in its employment. Accurate determination of theobromine in cocoa residues is therefore of some importance. Kay and Haywood[41] have made an investigation into the tetrachlorethane extraction method of Wadsworth and suggest certain modifications. The tetrachlorethane extract was found to contain ether-soluble substances other than theobromine, introducing an error if direct weighing of these extractives is relied upon. These substances may be removed by filtration after removal of most of the tetrachlorethane or their effect may be eliminated by nitrogen determination.

The presence of bitter almonds in sweet almonds can be troublesome and even dangerous, and a quantitative test for estimating the degree of admixture is welcome.[42] The test relies upon the evolution of hydrocyanic acid from macerated bitter almonds. Picric acid test papers are exposed to the ground sample under standard conditions, the degree of coloration being a measure of the quantity of bitter almonds present.

Modifications in the standards for **self-raising flour** have been coupled with a change in the method specified for the estimation of residual carbon dioxide,[43] these changes being made in the light of the experience and difficulties of manufacturers and analysts alike. By the new procedure available carbon dioxide is evolved by boiling with water instead of by evaporation to dryness.



Double distillation apparatus.

A recent method for measuring the **amolytic activity of diastase,** etc., makes use of the "cup-assay" technique evolved for the evaluation of penicillin.[44] The substrate is starch agar and the area of starch destruction is measured by staining with iodine.

Gum present in **salad cream** thickened with starch can be separated from the starch by digestion with calcium chloride, thus bringing both thickeners into solution, followed by precipitation of the starch with an excess of iodine. The gum remaining in solution is precipitated with alcohol and its presence confirmed with lead acetate.[45]

A sharper distinction between **wine or malt vinegar** and **spirit vinegar** is obtained by estimation of the reducing power of their distillate to alkaline permanganate solution than by the use of acid permanganate or iodine solutions.[46] Using the suggested procedure, the alkaline oxidation value of wine or malt vinegar distillates ranges from 50 to 185, while spirit vinegars range from 6 to 14. Artificial vinegar cannot be distinguished from spirit vinegar with this reagent.

Removal of interfering carbohydrates in the determination of glycerol in **wine** can be effected by precipitation with a 0·5N methyl alcohol solution of barium hydroxide in excess acetone. Glycerol is oxidised with permanganate to formaldehyde, and estimated photometrically with Denige's reagent.[47]

Microbiological methods of assay are well established for the determination of the **B vitamins** and of **amino acids.** Barton-Wright[48] describes details

for the eleven essential amino acids in a recent paper in the *Analyst*.

A sensitive reaction for gallotannin (tannic acid) and other tannins due to Feigl and Feigl[49] takes advantage of the precipitate formed with ferrous αα-dipyridyl. A positive test is given by wines, tea, and maté, but not by beer or coffee.

The **estimation of filth** (traces of insect infestation, manure, etc.) is dealt with in relation to a number of foodstuffs in the current volume of the *Journal of the American Association of Official Agricultural Chemists*.[50] The methods employed rely upon a number of means of separation. For example, insect fragments are collected by flotation with petroleum spirit and chicken manure in egg products is recognised by estimation of uric acid.

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Photos courtesy Townson and Mercer, Ltd.

Communal Grass Drying

THE Milk Marketing Board, in co-operation with Imperial Chemical Industries, have decided, as an experiment, to set up a grass drying unit which will serve a large number of small farmers. They aim to increase the output of pastures and to conserve for use in the winter months all grass not required for grazing and hay. The results should prove how far grass drying can be successful in producing an economic and valuable feed for better winter milk production.

The district chosen is that around Thornbury in Gloucestershire, and it is hoped that the plant will begin working on May 1 of this year.

Farmers will be asked to sell grass to the Board and they will in turn be given the option to purchase an equivalent quantity of dried grass. The Board will provide the equipment for cutting and handling the grass, so that there will be no call on the farmers' own labour.

The experiment is designed to show how far a grass drying service can be successfully organised on a communal basis and how far modern methods in grass drying can be brought within the reach of the small farmer.

BOOKS RECEIVED

The Principles and Practice of Wine Making. By W. V. Cruess.

A Summary of Food Laws and Regulations. By C. L. Hinton, F.R.I.C.

Tomato Ketchup and Sweet Thick Sauces

J. R. BURRELL.

THE main ingredients needed for preparation of tomato ketchup and sweet thick sauces are fruits (or fruits and vegetables), vinegar, gum, and spices, or their essential oils.

In order to make sure that the prepared sauce will keep indefinitely, it is necessary to bear certain points in mind. These mainly derive from the twin factors of sugar concentration and acidity, and it will be useful briefly to survey the field of manufactured products which contain significant amounts of sugar and a percentage of acid.

Acid and Sugar Basis

First of all it can be regarded as axiomatic that sugar solutions in the region of 70 per cent. or above are comparatively safe as regards the possibility of spoilage by moulds, yeasts, and bacteria, even although allowed to become infected with airborne contaminants. At the other end of the scale, however, fruit juices with sugar content down to say 5 per cent. of sugar will rapidly ferment.

It is well known that a small acidity of a sugar solution actually renders this substance a better medium for growth of microbial saccharolytic agents, but that a higher acidity makes it immune from spoilage altogether, so that, generally speaking, it can be said that products in which the sugar concentration is sufficiently high will keep without the addition of acid and without heat sterilisation, but that products which are, in effect, weak sugar solutions will either need to be rendered sterile by heating (after hermetic sealing in some sort of container) in order that micro-organisms will not gain access to the product subsequent to heat processing or by acidification to the extent that microbial fermentative agents will be unable to proliferate in it.

The latter method is the most convenient from every point of view except possibly that of flavour.

Fruit juices would be rendered inedible if this means were used, but some products lend themselves to acidification.

The following is a list of materials in which sugar is a proportionally main ingredient, showing the broad factors of sugar and acidic relationship.

	Sugar. Per cent.	*Acidity. Per cent.*
Jams and Marmalades ...	68-72	Less than 2
Chutneys	50-65	1-2½
Tomato Ketchup	7-20	1-2½
Other thick sweet sauces ...	10-55	2-3½

Providing such incidental physical factors as weakening of the surface by contaminating water, etc., are not allowed to interfere, the first will not be susceptible to spoilage by yeasts, moulds, or bacteria, although the acidity is very low and the capping not designed to be hermetic.

With regard to the second, which varies within fairly wide limits of sugar content, it is found that, at the higher levels of sugar concentration, the acidity is low while at lower levels it is much higher. As a general rule it can be stated that chutneys, like jams, are also not susceptible to microbial spoilage unless outside factors supervene.

With sweet thick sauces, however, the range of sugar content and acidity are more variable, and the first is usually much lower than in the products already mentioned.

Causes of Fermentation

Following a large scale investigation into the causes of fermentation into such diverse products as sweet pickles and sauces, salad cream and chutney (all containing sugar and acid), it was found that the overall acidity was not important, but that the acidity (calculated as though all the acid was present in the water content only) was vital.

The water content acidity that proved to be high enough to prevent the growth of practically all moulds. yeasts, and bacteria was found to be 3·6 per cent. calculated as acetic acid. That is to say that a weak sugar solution would need to have an overall acidity in the region of 3·6 per cent.; but if the sugar content, or rather total solids, were high —say fifty per cent.—the overall acidity could be halved, *i.e.* 1·8 per cent. overall acidity in this case would represent 3·6 per cent. on the water content.

This rule is found to be true for all sugar-acid products although, at times, where there has been gross initial contamination, spoilage has resulted by the evolution of resistant lactobacilli. However, cases of this sort, which are really due to defective hygiene, should not occur, and for all normal purposes the above can be accepted as a definite rule. For products which lend themselves to a fairly high acidity, therefore, it is wise to arrange a recipe that will embody the principle of 3·6 per cent. acidity calculated by arranging the overall acidity as though it were present only in the water content. This can be expressed by the following:

$$\text{Keeping acidity} = \frac{\text{Overall acidity} \times 100}{\text{Water content.}}$$

Where the solids content is low—for example, 10 per cent.—the factor mentioned does not make an appreciable difference, but where the sugar content —or in the case of salad cream fat content—is high, it makes it possible to manufacture products with a very low overall acidity.

Products prepared on this basis would not need to be heat-sterilised subsequent to manufacturing. Most thick sweet sauces are prepared on this principle. This may not be recognised by the manufacturer because most products have been prepared by the usual process of trial and error, but analysis would show that this is the case.

Achieving Palatability

With most thick sauces it is quite easy to achieve palatability on this basis, but with tomato ketchup it is usually considered that the acidity should be kept down and the sugar content not allowed to rise unduly as both these factors tend to mask the typical flavour of the tomato. In this case, therefore, the product is not listed among the articles that are prepared in such a way as to resist fermentation, but it is given a moderate sugar content and low acidity and it is either filled hot (180° F. or more) into bottles or is given a heat processing designed to reach and hold a temperature of 185° F. in the centre for ten minutes.

Although in this case the ketchup has not the acid : water ratio that would render it a completely unsuitable medium for the growth of fermentative agents, the nearer the relationship is to the 3·6 per cent. figure the greater the life of the product after opening.

In general it can be said that all thick sweet sauces other than tomato ketchup should be prepared on the basis outlined, *i.e.* keeping to the 3·6 acidity as acetic calculated on the water content only, but that the ketchup should be less acid (1·5 per cent. to 2 per cent.) and would require heat processing subsequent to filling into bottles.

Basic Recipes

Thick sweet sauces are prepared, mainly by boiling together and sieving, from fruits such as dates, sultanas, raisins, tomatoes, and apples; vegetables such as beets, turnips, and carrots, and vinegar, sugar, thickeners, and spices, or their essential oils. The sugar content, therefore, is partly due to the fruits present, and as nearly all sauces (not tomato, as a rule) contain dates in large quantity, it can be seen that the amount of sugar from this source is considerable.

The specimen recipes printed below are not copied from existing sauces, but are made up on theoretical considerations as to the fulness of flavour, etc., and as typical of the commercial article. That is to suggest that they would be suitable as basic experimental batches which could be modified in accordance with the result obtained, and the sugar and acid adjusted in accordance with the principles outlined after the analysis which should follow manufacture.

THICK SWEET SAUCE

Sultanas or raisins	65 lb.
Dates	80 lb.
Apple pulp	280 lb.
Chopped onions	20 lb.
Tomato purée	120 lb.
Sugar	45 lb.
Salt	15 lb.
Vinegar (5·0 per cent. acetic)	380 lb.
Water	25 lb.
Cloves	4 oz.
Ground ginger	1½ lb.
Ground cayenne	4 oz.
Bay leaves	1 oz.
Paprika	4 oz.
Gum tragacanth	5 lb.
Curry	4 oz.
Ground cinnamon	4 oz.
Ground cassia	4 oz.
Ground coriander	4 oz.
Caramel according to colour requirements.	

Where a sauce of the less sweet, popular variety is required, the sugar should be omitted entirely and the acidity increased to the desired tartness with 80 per cent. acetic acid. The pungency also needs emphasising and this is brought about by increasing the cayenne and cloves.

TOMATO KETCHUP

Tomato purée (single concentration)	635 lb.
Sugar	150 lb.
Distilled vinegar	62½ lb.
Water	62½ lb.
Salt	20 lb.
Minced raw onions	50 lb.
Gum tragacanth	10 lb.
Essential oil of cloves	½ oz.
,, ,, cassia	1 oz.
,, ,, cinnamon	1 oz.
,, ,, coriander	½ oz.
,, ,, pimento	¼ oz.
,, ,, paprika	½ oz.
,, ,, garlic	2½ c.c.

Machinery Requirements

In most cases it will be necessary to have ready for use:

1. Stainless steel or Monel metal boiling pans with mechanical stirrer.
2. Pulping and sieving machine (horizontal rotating brushes working against a stationary cylindrical sieve).
3. Bottle filling machine.
4. Capping machine.

5. Pump with hose attachment or fitted up so as to be conveniently connected to glass or stainless steel pipes. This is for transferring the sauce from the boiling pan to the sieving machine, but a stainless steel wheeled bogie could be used instead.

Apart from these it might be thought advisable in the interests of sauce stability to have a colloid mill, the milling to be a final process after sieving, but most manufacturers do not use a mill for these sauces. If the filling method is such as to lead to the temperature of the sauce falling below 180° F. during this operation it will be necessary to use an open water tank for subsequent sterilising. This would have to be fitted up with a steam coil and stirrer and a recording thermometer. If the supervision is adequate an ordinary long-stemmed thermometer would do.

Method of Manufacture

Tomato ketchup.—All ingredients but the tomato and the gum vinegar are brought to the boil and simmered for about half an hour. The gum and tomato are added and the whole simmered for a further ten minutes with stirring.

Following this, this sauce is transferred by stainless steel or glass pipe (or stainless steel wheeled bogie) to the pulping machine, which sieves the sauce and rejects lumps of material. It is then filled hot (after laboratory tests have shown that the product is up to standard as regards viscosity and acidity) and, if necessary, given a further heat-treatment following capping.

Probably the best method of incorporating the gum is for the latter to be put into some of the vinegar a day or two before it is required. After this period, during which stirring is required, it may be sieved before use.

Other Thick Sweet Sauces.—The ingredients are treated exactly similarly to the tomato, but if they are prepared on the basis outlined they need not be filled hot and they need no treatment after bottling. As a matter of fact it is considered advisable to allow the sauce to stand for a day or two before filling, for then there is less chance of the product separating later. While the material is standing (wooden barrels are suitable receptacles at this stage) it should be covered with cloth to prevent the entrance of drosophila flies which might otherwise give rise to their grubs in the bottles later on.

Laboratory Routine Testing

In order to be sure that no ingredient which might have the effect of lowering the acid to water ratio has been left out, or conversely, to be certain that no extra water has been put in, it is necessary to carry out routine testing for total solids and acidity. The latter can be carried out in a few minutes at the end of the boiling period; but as the determination of the solids may take some time, it will probably be ready at some time subsequent to bottling in the case of tomato ketchup.

The viscosity test is usually carried out with a funnel-standard to the firm manufacturing, and gives definitely relative results when trouble is taken to keep the temperature constant. Sometimes the torsion viscometer is used, and this also gives similarly reliable results under similar conditions. However, if for some reason something does go wrong with one particular batch, it is most difficult to make the sauce thicker or thinner without upsetting the balance of the recipe. More gum vinegar reduces the sugar content and probably increases the acid, while the addition of water or vinegar in thinning down dilutes the sugars and also in other ways spoils the recipe. It might therefore be best to regard viscosity tests only as a check on manufacture, whereas a low acidity can easily be rectified by a small amount of 80 per cent. acetic acid.

Total Sugar Determination

Another check on manufacture is provided by a total sugar determination—conveniently estimated by Fehling's method. The added sugar is all, or practically all, inverted during the boiling, but it is probably advisable to invert and then neutralise the solution of the sauce before dropping it by burette into the mixed Fehling's solution.

Bacteriological Routine Testing

For reasons which will appear later it is useful to prepare cultures from each batch of the sauces either prior to, or following, bottling.

The culture medium is malt agar used in the form of slopes. This is prepared by diluting 3 oz. of syrupy malt extract to one litre with tap water and adding 25 g. of powdered agar which is dissolved in the wort broth by boiling. The resultant medium is filled into tubes (about 6 ml. per tube) which are plugged with cotton-wool and after undergoing a sterilising process at 240° F. for twenty minutes, the tubes are sloped and upon solidifying are ready for use.

Wort cultures are prepared by streaking a full platinum loopful of the sauce all over the surface of the slope. These cultures are designed for use with sauces prepared on the 3·6 per cent. basis, and the presence of yeast colonies on the surface of the medium following several days' incubation at 77° F., should be regarded as a sign that the sauce will not keep. These cultures only take a minute or two to prepare, and even when many small scale batches are manufactured it does not take up a

great deal of time to prepare a culture tube from each one.

Tomato sauce occasionally becomes contaminated with heat-resistant lactobacilli which may develop and eventually give rise to foreign flavours, especially if the products are kept under mesophilic or thermophilic conditions. If soya meal is used in the sauce, this possibility may be increased, but generally speaking the probability of spoilage by lactobacilli or bacteria is not great, although an occasional inoculation of a small quantity of ketchup into sterile soya mash and incubating for about a week at 37° C. will be useful. The mash is made up in 50 ml. Erlenmayer flasks (5 g. soya meal and 25 ml. tap water). This is sterilised by subjecting it to 250° F. for thirty-five minutes in the autoclave. It also provides useful information if a few drops of bromo-phenol blue and 0·5 ml. N/2 caustic soda are added prior to sterilising.

Half a ml. of sauce is added to the mash by means of a sterile pipette (or previously sterilised and wrapped piece of glass tubing with wool plug at wide end). The flask is rotated to disperse the sauce and incubated at 100° F. Growth is shown by clotting, foaming, and visible signs of acid production as revealed by change in the colour of the indicator. The purpose of the alkali is to neutralise the acidity that would otherwise be given to the medium by the sauce. The medium should still be faintly bluish after inoculation. If this is not the case it is advisable to add a few more drops of caustic soda afterwards.

Spoilage Troubles

These are mainly bacterial and chemical.

With regard to the former and in relation to most sweet, thick sauces, it has already been stated that in order to prevent fermentation and the production of alien flavours in sauces, a certain definite relationship should be established between the acidity and water content. Cleanliness in preparation and hygienic conditions generally also play a part in preventing evolution of unusually acid resistant and/or heat-resistant types of yeasts, moulds, and bacteria.

Yeasts and moulds are fairly easily destroyed by heat as are most bacteria when in an acid medium. However, it must be remembered that higher temperatures are necessary to ensure destruction when the bacteria are in a sugar syrup. This principle is acted upon in fruit preserving; thus fruits in syrup are given a higher temperature or longer time of processing than fruits in plain water. However, in cases where the acidity is in the 3·6 per cent. region, there is little to fear from the action of bacteria, but at times trouble has developed in the weaker acid sauces. This has usually taken the form of production of alien flavour by lactobacilli, but occasionally there is a gaseous fermentation also. The cause has not been easy to establish at times owing to difficulty in getting the causative organisms to develop on artificial media, but soya meal on the whole has given good results.

If positive cultures are obtained from tomato ketchup it is advisable to increase the acid slightly by stages until all cultures are negative.

Yeasts and moulds are not a problem in tomato ketchup manufacture provided the temperature conditions are as set out, and provided the caps of the bottles make effective closures.

Yeast spoilage of the higher acidity sweet thick sauces begins during the cooling stage prior to bottling. It is a sign that the acidity is lower than it should be. If the sauce is tested before it is filled out, the acidity can be adjusted by the addition of edible quality 80 per cent. acetic acid and after re-boiling and cooling, the fermentation, which is little more than potential at this stage, will cease.

Summary of Precautions

A brief summary of the factors needed to be remembered in order to take adequate precautions against bacterial troubles is as follows:

1. The acid-water relationship in ketchup is not such as totally to prohibit growth of all bacteria.
2. The sterilisation process (or adequate hot filling) is sufficient to destroy all yeasts and moulds.
3. Some bacteria are able to make use of acetic acid as part of their metabolic scheme of things and others are able to multiply in a fairly high acid medium. The lactic bacteria are mainly concerned and some lactobacilli that appear to be indistinguishable from the tomato bacillus (*L. lycopersici*) thought to be synonymous with *L. acidophil aerogenes* and *L. brevis* are implicated. The thermal death point of varying strains of this organism seems to differ very widely and it may be that several allied strains are involved. These bacteria do not survive boiling, and contamination sometimes occurs between boiling and filling into bottles.
4. The acid-water relationship of thick sweet sauces prepared as outlined is sufficient to prevent yeast, mould, and bacteria spoilage providing the initial contamination is kept low by sufficient attention to hygiene.

Chemical Spoilage

If sauces are prepared in iron or copper vessels, the colour will be modified to some extent. Iron tends to darken the material partly by the formation of tannates, while copper is liable to give a greenish or greyish tint. Darkening due to iron may not matter to any extent in a sauce that is to be darkened artificially in any case. (It is normal to use a proportion of caramel for this purpose.) With tomato ketchup, however, the brightness of

the product is sometimes accepted as being partly an index of its quality, and stainless steel should certainly be used in this case. If metal caps are used in bottling, the metal should not come into contact with the sauce as it may cause trouble, this time starting from the surface of the sauce at the neck of the bottle. Patent caps are usually made up so that various impervious substances (drying-oil-permeated paper discs, treated cork composition, and synthetic resins) come between the metal and the sauce.

The bottles should not have an unduly large headspace as this may produce oxidative changes at the surface. Also, if the headspace is large, during a warm day the contained air becomes heavily charged with moisture, and at night, when cooler conditions prevail, some of this is deposited on the neck of the bottle or on the surface of the sauce. Several cycles of these conditions may lead to definite weakening of the sugar syrup, and in cases where cold filling has been followed, this may lead to yeast or other fermentation.

Other Spoilage

Precautions must be taken during the course of manufacture to ensure that an undue amount of air is not beaten into the sauce as this may lead to streaking or actual separation of liquid and solid constituents. Although viscosity and stability seem to go hand in hand, the thicker sauces, with a definite set, seem to be most prone to streaking, or dark trails caused by slowly ascending air bubbles. These trails coalesce in some cases, thus providing a beginning for eventual separation. There is also a phenomenon, perhaps not fully understood, where if a bottle's contents are shaken vigorously, a mass of air bubbles takes up some of the solid constituents to the top.

Use of Thickeners

Separation in a most marked form sometimes occurs when flours or locust gum are used as thickeners. These materials break down in the presence of acid, and after a lapse of time the upper contents of bottles of sauce prepared with these may become quite clear.

The extreme brightness or clarity of some examples of this type is interesting and is a pointer to the apparently complicated phenomena involved, for the material is clarified to a similar extent as it would have been if egg albumen had been used for clarification.

Experience shows that gum tragacanth is far and away the most reliable thickener and stabiliser for sauces, for although it is affected by the combined factors of heat and acid, it is less affected than most other materials used for a similar purpose.

Indian Food Industry

INDIA proposes to spend £75,000,000 on imported capital goods during the next five years, to reorganise the food processing industries set up or enlarged in war-time.

The Food Department intends to open an information bureau designed to provide home industrialists with expert technical advice on the establishment of food industries, and five technical panels have already carried out preliminary surveys, and made recommendations on the scope of future development of food processing industries.

Noteworthy progress has already been made. For instance, value of biscuit and sweet imports dropped from £270,000 in 1935-1936 to £1,400 in 1943-1944, largely due to the spectacular growth of local industry. The country is now exporting biscuits, and the Government has decided to remove import restrictions. Twenty large biscuit factories, with an average total output of 1½ tons per day, are now in operation.

The edible oil industry has also expanded. In 1939 there were ten factories with an annual capacity of 115,000 tons. Today there are twenty-two factories turning out 182,000 tons. It is estimated that by the end of 1947 these will have increased to sixty-nine, with an aggregate capacity of 460,000 tons, of which 26,000 tons represent hardened oil for industry.

Production of sugar and sugar confectionery at present does not meet the demand, but a five-year expansion programme is already being planned. In addition to the existing 170 sugar factories, concentrated mainly in Bihar and the United Provinces, forty-five are being erected in other areas.

The Government faces the problem of maintaining standards of processed foods, and keeping products at reasonable prices. No legislative measures are proposed at the moment, but a check will be kept by exerting economic pressure and offering facilities to those conforming to standards fixed by the authorities.

Soya Flours in Baking

MUFFINS, plain shortened cakes, and angel food cakes prepared from eighteen samples of soya flour have been compared as to baking quality. (*Food Research*, **11**, No. 5, p. 454.) Some degree of preference seems to have been found for the use of high-fat soya flour in the preparation of muffins and possibly of cakes. In a limited study of angel food cake, it was found that larger amounts of minimum-fat soya flour than of either of the other types could be used without detrimental effect on the flavour or other qualities of the product.

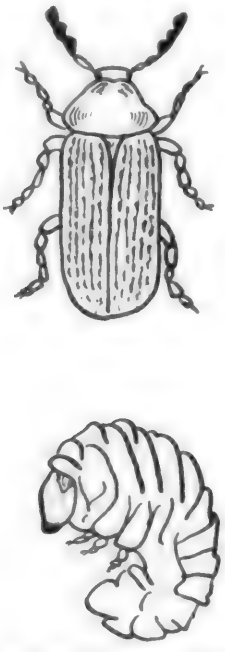
The Drug-Store Beetle Menace

FREDERICK BURKE, F.R.M.S.

The drug-store beetle (*Stegobium paniceum*) is a common pest infesting food products. Its distribution is world-wide, and because of its ability to feed on a great variety of commodities it is one of the most injurious insects encountered in food factories and stores. This article describes the history of the beetle and methods of its control.

THE drug-store beetle is frequently found infesting bread and flour, but almost any organic material seems to serve as nourishment for the insect and its larva. Such poisonous drugs as belladonna, strychnine, and aconite have been found attacked, and it is from the habit of feeding on such materials that the insect has earned its popular appellation. It is also known to live and reproduce in Cayenne pepper, and considerable damage has been done by the insect boring through lead sheeting.

In the adult state the drug-store beetle is between two and three millimetres long. It is roughly cylindrical in shape and of a uniform reddish-brown colour; its body is clothed with fine silky hairs. The beetle's antennae end in three large joints which give them a club-like appearance. Eggs are laid singly by the female in all varieties of foodstuffs. Normally eggs hatch into larvae in from six to ten days, but a great deal depends on the prevailing conditions of temperature.



The drug-store beetle and larva.

The larvae are small white grubs covered with hairs and possessing three pairs of small legs. Their abdomen is usually arched forward, giving the larva a humped-back appearance. This stage generally lasts from three to five months at normal temperatures. Under exceptionally favourable conditions of temperature and humidity, however, the larval period may be considerably shortened. When larvae are fully fed and ready to change to pupae they either burrow into the food material or construct cocoons by fastening food particles together. The pupal stage lasts about two to three weeks.

Altogether the complete life-cycle of the beetle takes six or seven months, but during very warm weather may be completed in half this time.

Aids to Control

The maintenance of strictly hygienic conditions in factory, packing-room, and store will help considerably in reducing infestations caused by the drug-store beetle. Dusty and greasy machinery, dirty storage rooms will favour the development of the beetles, and it is therefore in the interests of the food manufacturer and warehouse manager to see that the premises under their control are kept as clean as possible. All food scraps should be swept up and disposed of at the earliest possible opportunity. Food which has become heavily infested with beetle should be burned without delay to prevent infestation spreading further.

Temperature and humidity are important factors in the development of the beetle in all its stages, and in consequence cool dry storage greatly facilitates its control.

When factory or storage rooms are only mildly infested with beetle it is usually sufficient to treat with an insecticide. Many excellent insecticidal

sprays can now be purchased, but one containing DDT or pyrethrum in oil is to be preferred.

In the employment of such preparations it is important to pay particular attention to corners and crevices which are likely to harbour beetles. Organised spraying at frequent intervals is essential for effective control, as one application of insecticide is rarely ever sufficient to keep down the pest.

When the drug-store beetle becomes exceptionally troublesome fumigation is undoubtedly the only effective method of control. Of the many fumigants from time to time advocated for this purpose probably chloropicrin, ethylene oxide, and hydrocyanic acid have proved most efficient.

Fumigation with chloropicrin at the rate of 20 oz. to every 1,000 cu. ft. of space will be found effective if left for twenty-four hours. Care must be exercised in the use of this fumigant because of its lachrymatory effect.

A mixture of ethylene oxide and carbon dioxide used at the rate of 2 lb. per 1,000 cu. ft. for a period of forty-eight hours will give good control.

A still more effective fumigant is hydrocyanic acid gas if left exposed for twenty-four hours at the rate of 4 to 5 oz. of liquid hydrocyanic acid per 1,000 cu. ft. of room space.

It cannot be too strongly stressed that the greatest caution is needed in the use of these fumigants because of their poisonous nature. Only persons fully trained and experienced in the employment of these substances should be allowed to handle them and in all cases instructions for their use must be adhered to strictly.

Frozen Sausage

TESTS have recently been conducted at the Quartermaster Food Container Institute, Chicago, in order to find a satisfactory method of preparing pork sausage for freezing which would provide maximum stability, appearance, and palatability.

Three lots of sausage were prepared identically except for the seasoning. One lot was seasoned with salt, pepper, sugar, and sage. Another contained sage, pepper, and sugar only, and the third was prepared without seasoning. The samples were then frozen at zero degrees and placed in storage.

It was noted that at the end of three months the sausage which contained salt had deteriorated, both in appearance, flavour, and smell. After each succeeding month of storage the samples containing salt showed continued deterioration.

The tests proved that seasonings, other than salt, had little effect on the development of rancidity during freezing, storing, or cooking.

Ministry of Food

Latest Statutory Rules and Orders

The list given below is the continuation of the list of Orders published in *Food Manufacture*, March 1, 1947, page 126.

No.	*Date.* 1946.	PRICE FIXATION ORDERS
1742	Oct. 28.	Order amending the Wheat (Control and Prices) (Great Britain) Order, 1945, and the Wheat (Control and Prices) (Northern Ireland) Order, 1945. (Prices, November, 1946, to July, 1947.)
1796	Nov. 7.	Order amending the Table Jellies (Maximum Prices) Order, 1946.
1807	,, 7.	Order amending the Flour Confectionery (Control and Maximum Prices) Order, 1946. (Iced cakes.)
1953	,, 20.	Canned Fruit (Prohibition of Retail Sales) Revocation Order. Revokes S.R. & O. 1946 No. 1323.
1989	,, 26.	Poultry (Control and Maximum Prices) (Amendment) (No. 2) Order. (Turkeys.) Revokes S.R. & O. 1946 No. 1914 Poultry (Control and Maximum Prices) (Amendment) Order, 1946, which was not published.
2039	Dec. 3.	Order amending the Eggs (Control and Prices) (Great Britain) Order, 1946.
2040	,, 3.	Order amending the Eggs (Control and Prices) (Northern Ireland) Order. Revokes S.R. and O. 1945 No. 646; 1946 No. 862.
2042	,, 3.	Animal Fats (Control and Prices) Order. Revokes S.R. and O. 1943 No. 1768; 1945 No. 123; 1946 No. 1410.
2042	,, 3.	Oils and Oilseeds (Control) Order. Revokes S.R. and O. 1939 Nos. 1371, 1614.
2046	,, 5.	Order amending the Meat Products, Canned Soup and Canned Meat (Control and Maximum Prices) Order, 1946. Revokes S.R. and O. 1946 No. 1542.
		KITCHEN WASTE
2257	Dec. 31.	Kitchen Waste (No. 2) Order.
		LABELLING
2169	Dec. 19.	Labelling of Food Order. Revokes S.R. and O. 1945 Nos. 464, 1178; partially revokes S.R. and O. 1944 No. 1447; 1945 No. 1550.
		POTATOES
2243	Dec. 31.	Order amending the Potatoes (1946 Crop) (No. 2) Order.

Food in Parliament

SPECIALLY CONTRIBUTED

MANY are the occasions when debates on other issues provoke Ministers or their critics into references to food manufacture. Such an occasion was the Second reading of the Agriculture Bill.

The Agriculture Bill

The Bill was well received by the House, which was apparently satisfied on the whole that its twin objective of stability and efficiency would be a benefit to all parties concerned. If the main method of providing stability—namely, assured markets and guaranteed prices—tends to keep the latter slightly higher than would otherwise be the case, food manufacturers may nevertheless welcome a state of affairs which facilitates long-term planning. Because farmers will be able to plan ahead with security, the consumer should enjoy the same advantage.

There is provision, however, against the exploitation of the consumer by the demand that stability shall be matched by efficiency, and the House is in the main satisfied that farmers will be kept up to the necessary level without undue interference.

Cereal Supplies

It is interesting to note the high proportion of matters raised at question time which are directly related to agricultural issues, as for example in the case of cereals or sugar. Mr. Strachey has informed us that in 1946, 53,700 tons of home-produced ready-to-eat cereal breakfast foods, worth about £5,799,000 at retail prices, were distributed, and that none of this type has been imported since 1942. During the year 229 tons of imported pre-packed oatflakes worth about £9,600, and 29,892 tons of home-produced pre-packed oatflakes worth £1,307,800 were distributed. The House was glad to hear his assurance that every encouragement is given to home manufacturers to meet the country's requirements.

Some days later the Minister was asked what steps he was taking to secure supplies of cereals from sources other than this country and North America, so that the maintenance of our supplies for next winter should not depend solely on the ability of North America to export. It appears that substantial quantities of wheat and coarse grains are expected from Argentina this year, but that other sources outside North America would only provide relatively small quantities. Dr. Summerskill told another questioner that the total amount of home-grown wheat delivered to mills in the five weeks ended February 1 was 220,000 tons. The amounts for the four weeks ended December 28 and November 30 were 88,000 tons and 112,000 tons respectively. The Minister regarded this as a very satisfactory response to the Government's request for increased threshing. Dr. Summerskill added that wheat containing up to 50 per cent. of sprouted grains would continue to be accepted by flour mills if otherwise sound.

Sugar Beet Output Increase

Sugar has been referred to under the headings of beet factories, Government subsidies, and West Indian prices. Mr. Tom Williams was questioned closely concerning the capacity of beet factories to deal with the available crop. He gave the undertaking that no sugar beet factory had yet closed or would close while beet can be supplied in sufficient quantity. When Mr. Stubbs suggested that hundreds of tons of beet were lying at the roadside and that lorry-loads had been refused at the factories, the Minister said he understood from the factory managements that they were ready to receive all beet fit for use as rapidly as their machinery could be put to work. He reminded the House that this year's output of sugar beet was about half a million tons more than the average. The factories were working twenty-four hours a day. They could not cope with more than they had been receiving, and he hoped they would remain open until the last lot of sugar had been dealt with.

The Minister has given some interesting figures on Treasury subsidies to food manufacturers in connexion with their consumption of sugar. The price of sugar to food manufacturers is lower than the current cost of production because of recent increases in the price of raw sugar. In 1946 the cost to the Exchequer was £1,972,000, made up as follows:

	£
Sugar confectionery	742,270
Flour confectionery	827,770
Chocolate...	214,700
Soft drinks	127,930
Ice cream...	59,530

In answer to a critical supplementary, Mr. Strachey insisted that without the subsidy the cost of these foodstuffs would necessarily rise. In a written answer the same day the Minister revealed that it had been agreed that the price to be paid for West Indian sugar should be increased by £4 15s. od. to £24 5s. od. per ton. It had been further agreed that of this increase £2 would be paid direct to sugar manufacturers to enable them to meet in-

creased costs. The remaining £2 15s. 0d. would be allocated to various special funds for the benefit of the industry.

Container Shortages

Turning from foodstuffs to their containers, the President of the Board of Trade has been asked what steps have been taken to improve the supply of glass bottles during 1947. Pointing out that the output of bottles is well above the pre-war level, Sir Stafford Cripps has admitted that it is still insufficient, and says that everything is being done to stimulate production. In addition, substantial imports are being licensed. In the salvaging of bottles the President stated that nothing was being done except by individual firms salvaging bottles of their own. In the case of some goods the customer was unable to make a purchase unless returning an empty bottle in exchange.

On another occasion, however, the Minister of Food stated that many local authorities still maintained an efficient salvage recovering service which included 6 oz. bottles, and was rightly chided by Mr. William Shepherd for giving such an answer without producing any evidence to support it. There would seem to be some lack of unanimity between Departments on this subject

Labelling Standards

The House is also interested from time to time in the contents of labels which manufacturers affix to their products. A recent example of this was a question on consultations with jam manufacturers "to ensure that the product is labelled to show what the fruit content really is." It was announced that consultations with the jam manufacturers were being started during February, and Members will be interested in due course to learn the result.

Plea for Variety in Cheese

The only debate in recent weeks to be wholly devoted to food manufacture was that initiated by Mr. Keeling on the Cheese Order No. 2019. Seeking the annulment of the Order, Mr. Keeling pleaded for more variety in the cheese "which is put on the British luncheon table or in the British workers' luncheon packet." He lamented that the vast bulk of the cheese we consumed today is American or Dominion cheddar, "commonly called mousetrap." He pointed out that the Order prohibited the manufacture of any cheese in this country except on licence, and that under this stern control most of the cheeses of yesteryear had disappeared.

Replying to the debate, Dr. Summerskill said it was the policy of the Ministry to try to meet the tastes of the majority of the people in this country. She gave the information that 90 per cent. of our cheese was imported, and that 98 per cent. of the imported cheese was on the ration. The Ministry have tried to introduce cheeses which would provide a little variety, but in the main they had controlled cheese manufacture so as to protect the diet of the people.

This policy was challenged by Mr. Lennox-Boyd who alleged that the doctrine of the Ministry seemed to be to settle what people ought to eat instead of providing what they wanted to eat. There were a large number of people, he said, who wanted alternative types of cheese, and they were by no means limited to a small social class. The motion for the amendment of the Order was, however, defeated.

Quick Freezing Prospects

Dr. Summerskill, in answer to Mr. Gerald Williams, has announced that licences have been issued for the erection of quick freezing plants at eleven food factories. This is a subject of which both the House and the country will be hearing more and more in the months ahead.

Britain's Macaroni Industry

(*Concluded from page* 152)

macaroni undergoes six or seven different processes.

The modern manufacturer in this country exercises great care to exclude all forms of contamination, even to the extent of filtering the air used in the drying-rooms, and this, together with the thermostatic controls of temperature and humidity of the air, assists in obtaining a perfect physical condition in the macaroni. This modern process is therefore more hygienic when compared with open-air drying which was used for much of the Italian macaroni before the war.

When the drying process is completed, the moisture content of the macaroni or spaghetti is around 11 per cent. and the material has a smooth finish, is pale amber in colour, and when broken shows a glassy fracture. The finished product is then tipped into hoppers and passes into automatic weighers and packers.

The macaroni manufacturers, who may feel proud of their achievements in building up a new industry during the war years, are now intensively examining the possibilities of further developments in the process of manufacture in order to popularise alimentary paste products in this country to an extent comparable to the consumption in America and on the Continent. There is much to be done but it is not incapable of achievement if tackled in the spirit in which this new industry has been born.

Food Research in Eire

The Government of Eire, in 1941, set up an emergency Scientific Research Bureau for the purpose of advising upon problems relating to industrial processes and the use of substitute materials, and on the use of native and other materials to meet deficiencies caused by the restriction of imported raw materials and commodities.

A REPORT has recently been issued which states that during 1941 the Bureau commenced an examination of the possibilities of the storage of yeast with a view to arranging for the reservation of supplies in selected areas throughout Eire against possible interruptions in transport. Investigations were made of the effect of temperature on yeast storage, and the effectiveness of many different media for increasing the life of yeast was also studied. It was concluded that it would not be practicable to arrange for yeast storage on any comprehensive scale under the conditions which existed, and, as an alternative, arrangements were made for the accumulation of stocks of sodium bicarbonate to be used in place of yeast for breadmaking if supplies of the latter should fail.

Experimental work, carried out by yeast manufacturers at the instance of the Bureau, showed that yeast satisfactory for breadmaking could be manufactured with the qualities of superphosphate and ammonium sulphate available from home sources. This result ensured continued production of yeast for breadmaking in the event of a failure in imports of the chemicals normally used in its manufacture.

Flour Investigations

In normal times the flour used for breadmaking was wheaten flour of 70 per cent. extraction. From the end of 1939 onwards, difficulties were experienced in maintaining the country's requirements of flour, and, to ease the position, the extraction was continuously increased until in May, 1942, wheaten flour of 100 per cent. extraction became the standard. The Dietetic Council of the Medical Association of Eire drew the Bureau's attention to the danger of calcium deficiency resulting from the general use of 100 per cent. extraction flour, on account of its high phytic acid content. The Bureau made a number of enquiries in regard to the effect on the health of the community of such flour, and the information obtained was brought to the notice of the Departments concerned.

In December, 1943, the 100 per cent. extraction flour was replaced by a flour made from wheaten flour of 85 per cent. extraction, with added barley flour. Difficulty was experienced in the use of this flour in home baking. The Bureau co-operated with the Irish Flour Millers' Association in carrying out a series of baking tests to determine the best methods of home baking with the flour then available. A satisfactory baking technique was devised and the recommended methods of home baking were brought to the notice of the public by the flour millers. A modified technique had to be developed when, in November, 1944, barley was omitted, and the flour consisted merely of wheaten flour of 85 per cent. extraction.

Addition of Calcium to Flour

The use, during the emergency, of flours of high extraction focused attention on the question of the addition of calcium to flour as a means of overcoming the deleterious effect of the phytic acid content of such flours. The Bureau assisted in an investigation as to the most suitable source of calcium for the purpose. Representatives of the Bureau visited Great Britain and made enquiries there on the matter. The Department of Supplies made arrangements for tests by the flour millers with samples selected by the Geological Survey of naturally occurring calcium carbonates as additions to flour for breadmaking. The results indicated that, should the necessity arise for the addition of calcium carbonate to flour, suitable sources of material could be located within the country.

Potato Flour for Breadmaking

The suggested use of a proportion of potato flour in breadmaking as a supplement to wheaten flour was examined by the Bureau. The Bureau recommended that if it were necessary to supplement wheaten flour with potatoes it would be best to arrange for the addition of the maximum quantity of potatoes to wheaten flour during the periods when adequate supplies of good quality potatoes were available, and so reserve wheaten flour for periods when potatoes were scarce. This course was considered preferable to the preparation of potato flour which involves the drying of the potatoes, the use of a considerable amount of fuel, and heavy wear and tear of plant.

Agar Research

For several years before the establishment of the Bureau, research on seaweed had been in progress

at University College, Galway, under the auspices of the Industrial Research Council. Experiments made in the course of this work indicated that certain species of *Gelidium*, discovered in Galway Bay by members of the Natural History Department of University College, Galway, were suitable for the production of agar. No information was available as to the quantities of suitable algae that could be obtained, and it was accordingly decided that a survey of the west coast should be carried out with a view to the location of seaweeds suitable for the preparation of agar-agar. In view of the urgency of the matter, it was arranged that the work should be carried out, under the auspices of the Bureau, at University College, Galway.

It was found that although the agar seaweeds occur in much smaller quantities than carrageen, there was sufficient available to make collection worth while in certain localities in Galway, Clare, Kerry, and Cork. Gatherers in the more important districts were instructed in the identification of the weeds, and supplies were purchased by a Galway firm, who undertook the manufacture of agar-agar by a process developed at University College, Galway, in the course of the investigations carried out under the auspices of the Industrial Research Council. The quality of the commercial product has been found suitable for bacteriological work.

Cold Comfort for the Refrigeration Industry

MR. HUGH DALTON, Chancellor of the Exchequer, had no encouraging news for Britain's food or refrigeration industries when he was the principal guest at the annual luncheon of the British Refrigeration Association.

The function was held during the industrial "shut down," and just as the Chancellor rose to give his address the lights were switched off and he spoke in a room illuminated by candles.

He said that by exporting refrigerators rather than selling them at home the industry would help the country in two ways. It would help to pay for imports and would save electricity which, in these days, the nation could not afford.

That was cold comfort for food manufacturers, many of whom wish to extend or renew their refrigeration plants as early as possible.

He referred to the "Economic Survey," then about to be published, and stressed that it blamed the six years of war for the country's present plight. That statement caused a good deal of laughter. When the Chancellor referred to a second White Paper that was being prepared, his audience exclaimed, "What, another one?"

Then he told the oft-repeated story that the only way to beat the shortages was to increase production, but he uttered not one syllable on how manufacturers were to obtain the raw materials with which to increase their output.

It was left to Mr. E. G. Batt, the independent chairman of the Association, to give a frank exposition of the seriousness of the position from the standpoint of refrigeration engineers.

"So far as production is concerned, I am afraid that the position is not bright," he said. "I often wonder whether it is any one individual's responsibility to know and realise the time and man-power required to fill up the forms which industry receives from time to time. I have a feeling that each Government Department just looks at its problem individually, and fails to realise the total time and effort which is required—and often wasted—in meeting the requirements of all Departments.

"Many of the forms are most difficult to understand. I believe we could be largely rid of the present craze for 'form-filling,' and so enable the thousands of people now employed in this connexion to be released for work of a productive character."

Mr. Batt said he felt very uneasy about the Electricity Bill, and he also criticised the Government policy of building up exports at the expense of the home market.

"The export trade a manufacturing concern can obtain against world competition depends upon its efficiency and the total volumes of its trade at home and abroad," he said. "Any reduction in the volume and variety of home trade caused by Government manufacture or the slowing down effect of the fear of its happening, must result in an increase of production costs and a consequential decrease in the manufacturers' ability to secure export orders."

Protein Therapy

IN many instances of infectious disease, prompt control of infection by sulphonamides or penicillin is not followed by the desired degree of systemic improvement. A factor which is often responsible for delayed recovery is known to be the intense protein depletion which not only accompanies, but also follows in the wake of, infectious disease. Frequently, recovery can be hastened by correction of existing nutritional deficiencies, foremost among them, protein deficiency. A protein intake, adequate both in quality and quantity, thus gains increasing significance as an integral part of treatment in cases of infectious disease.

The Present Position of Rat Control

ERIC HARDY, F.Z.S.

THE rat, like the poor, is always with us. The world shortage of food and the difficulties of distribution have inflated the cost of its damage. This has been evident during the past twelve months in France, Egypt, Britain, and several other countries, and the rat appears to defy persecution and fights back with undiminished vigour. It is very difficult to find any local rodent control authority willing to admit that the rats are not diminishing in their area of jurisdiction and that their personal campaigns are not meeting with every success. Apart from the public health side, where progress has been greatest, the damage by rats and mice in town and rural industries is still serious, and a detailed twelve-months rat survey is in the course of preparation by all centres for the Ministry of Food.

Since about 1943 the efforts towards rat control in this country have been more or less standardised, and several local authorities which were none too active in the past were shaken into action. A recently published illustrated brochure* gives in practical form the organised methods, particularly in relation to pre-baiting, which are now generally universal in this country following the war-time co-ordination by the Ministry of Food. Had this literature been available at the beginning of the war a better result might have been obtained. As it was, Ministry of Agriculture Leaflet No. 244 and Bulletin 30, in general use early in the war, lacked the illustrations which give the recent publication such value as "visual aids."

In Liverpool the corporation rodent control officer feels that the rat population was reduced during the war-time campaign and that conditions are much better than they were; nor does he look upon the blitzed sites as any serious breeding source of future infestation. In Manchester the blitzed sites, now cleared, do not give much trouble either, although the disused drains left were at the time a trouble. The rat damage position there keeps much the same, and despite fluctuations has not changed much during the war.

How Much does the Rat Fight Back?

How much the rat fights back against modern methods of control is a moot point. In one northern manufacturing town where a well-known patent rat virus is made, the local rats developed an immunity towards it and rats had to be collected from elsewhere for their tests. In the farming districts where many of the town methods are not applicable, the effect of the wild predators—fox, stoat, badger, owl, buzzard, even the roaming cat—are worthy of a full investigation, such as a detailed examination of the droppings of these mammals from several centres. It was commensurate with the great destruction of predators as "vermin" in this country that the rat menace increased so much.

There is yet to be seen the full effect on the rural rat population of the new war-time field drains. Sewage farms are a general source of rat infestation in the country, and army camps often another. The reviewer was an Army rodent control officer (because nobody else wanted the job!), and the official help received can be summed up as *nil*. He had to chase around to find his own ratcatchers: indents for baits, poisons, traps, etc., though the official channels as per A.C.I. were so very long in materialising as to arrive when he had moved, so that he always worked outside official channels, both at home and overseas, and would get the local town council's fumigation plant or organise a good day's ratting.

Army cookhouses were often the trouble in large camps, and the average rodent officer, necessary under A.C.I., paid little attention to the job as it was one of the many extra, honorary jobs which were usually pushed on the M.O. or some subaltern stooge already loaded with sports, welfare, savings, and other "buckshee" jobs. There is no record of an Army rodent officer being put "on the mat" if he did nothing about rodent control beyond make a few useless returns to H.Q. This reviewer found no official liaison with the civilian authorities, and in some places near London found very bad rat infestation when camps were taken over.

Modern Control

The main basis of modern control, outlined in the Government's new brochure, is to search for the presence of rats and mice by noting smears, runways on refuse dumps and in dust, gnawing marks even on lead piping, droppings, footprints, damage to goods or the disappearance of test baits, or scrapes for holes. This pre-baiting with 1 oz. test baits when it is not certain whether or not rats are present is a very prominent part of modern control, and the infestation is estimated

* *Infestation Control: Rats and Mice.* H.M.S.O. Pp. 36. 1s. 6d. net.

in the term of rat numbers left on the building, not in numbers of rats caught.

This pre-baiting is far more satisfactory than leaving a poisoned bait without any previous testing, which often leads to bait-shy rats. After the unpoisoned bait is discovered to be harmless, and the rats have fed freely for several nights, the poisoned form is substituted and the rats will then feed freely on this and imbibe sufficient quantities for a kill. This method is not new and it was commonly practised before the war; but it was not given the prominence or widespread use that obtains today. To test the number of survivors, plain bait is again resorted to, and upon the result is the decision for or against a second poisoning. The very effective new rat poison alpha-naphthylthio-urea (" Antu ") is not yet generally available.

In his own work with food factories the reviewer found that rat-proofing the building is most difficult to maintain owing to the use of loading conveyors and of night shifts of workers opening doors, while on the other hand the old-fashioned rat-catcher with his ferrets and dogs, although still engaged by many town councils, has little permanent effect unless advised and trained under modern methods. It is for such people that the new brochure has most value, for to the professional rodent officer it contains nothing new, but gives routine methods in a more practical form than hitherto.

Quick Freezing for the Layman

HOME freezing and low temperature storage lockers are features of life in America not yet introduced into Britain, although quick frozen foods are now being developed. Quick frozen foods are coming to stay, and the answer to every question the layman is liable to ask is contained in a comprehensive digest* of facts established by research over several decades into the preservation of foods by freezing.

The title of the first chapter—" The Food of the Future has a Past "—indicates that the subject of food freezing is approached by an enquiry into its necessity. The increase of population, and the necessity for the preservation of seasonal surplus had given an impetus to slow freezing or refrigerated warehousing of the three principal commodities, meat, butter, and bacon, but to many other foods refrigeration had not been applied.

The development of quick freezing of fish was successful enough to warrant the application of the new system to fruit, vegetables, and meat. The authors describe graphically the discovery by the American people that quick frozen foods retain the flavour in all its richness of the fresh article, that seasonal foods can be procured all the year round, and that quick frozen foods ensure a minimum of waste, preparation, and cooking.

Valuable hints on choice of and preparation of foods for quick freezing, on the management of home freezers, on the thawing, preparation, and cooking of frozen foods are given in admirable detail. The storing of home-frozen foods in private lockers in a locker plant is fully described. The financial side of home freezing is analysed, and it is shown that after paying all costs of freezer maintenance, locker rental, raw materials, packaging, etc., most average families can save £20 to £30 per year on their food budgets, at the same time enjoying a 30 per cent. to 50 per cent. increase of consumption.

These are remarkable figures, and merit close attention. Eating better at less cost is something that we all want at any time, but in these days of short supply and high cost, eating more and paying less is an attractive proposition.

The authors describe a novel store which was opened to serve customers with nothing but frozen foods, including fruit pies, cakes, stews, chickens, soups, meat balls, Welsh rarebit, and many other frozen cooked foods requiring only thawing and heating before eating. For those homes possessing freezer cabinets, once a week delivery of frozen foods in bulk was arranged. The authors comment that a store devoted solely to frozen foods introduces to the public the trend of marketing both commercially prepared fresh and cooked frozen foods. In the near future, the food section of every department store, the grocery store, and the market stall will stock a complete range of frozen foods of all kinds, including a wide variety of rolls, cakes, pies, bread, and prepared dishes. Frozen food items will become a part of everyone's shopping list.

Quick frozen foods are the equivalent of fresh foods, nutritionally speaking. The life cycle: we eat to work to earn money to live to eat to work to earn money—is so true that no one dares to quarrel with it. And the structure of living falls down if we eat indifferently or without intelligence.

Food is a major topic today. *Into the Freezer —and Out* provides one answer to the problems that beset every household. It is written in non-technical language, mainly for the layman.

Well illustrated and splendidly produced, the book should be added to every refrigerationist's library and to the library of everyone connected with or interested in food production. It will also prove a useful addition to every housewife's collection of cookery books.—A. E. M.

* *Into the Freezer—and Out*. By Donald K. Tressler, Ph.D., Clifford F. Evers, B.S., and Lucy Long. Pp. 223. New York. $2.50 net.

Photographic Recording Developments

ECONOMY OF TIME AND LABOUR

An operator at Cadby Hall places the special order forms in the carton after going through the process outlined below. *Courtesy Kodak, Ltd.*

One of the latest developments to save time and space in the copying and storage of records is the automatic photographic system. The copying is done in special cameras, designed to photograph up to several thousand documents per hour. Ninety-six rolls of film, containing records of some 400,000 5 in. × 8 in. cards, can be kept in a filing drawer which would hold only 3,600 of the actual cards.

This photographic method is particularly useful in normal trading, where manufacturers deal regularly with the same customers, or market numerous lines selling at a fixed price.

The following is a brief description of the system in operation by J. Lyons and Company, Ltd.

Printed order/invoice forms are used for bakery and ice cream customers, on which are printed the lines normally available, the retail selling price, and columns for entering quantity required and cash extensions. There is also a space for entering the customer's name and address. At the bottom of the order form are two detachable stubs—one for posting and the other for packing.

After being completed by the traveller, the form arrives at Cadby Hall, where a clerk checks the entries on the form and calculates the cubic capacity of the order. The customer's addressograph plate is selected and an impression of this made on the ledger posting and packing stubs and on as many labels as required. The address on the order form is compared with the addressograph plate impression. The order is then passed through the National Cash Register which prints on the body of the order/invoice and on the detachable ledger posting stub, date, serial number of the order, and the amount to pay. After registration the amount posted is compared with the figures entered by the clerk, and the ledger stub detached. The order form is then photographed by the Recordak camera, and is finally sent to the packing floor.

Here the staff see at once which cartons to use, the goods are packed, with the original order included as an invoice, labels affixed, and the serial numbers of the labels entered on the packing stub, which is detached and returned to the office. Should any query arise, the film of the order, and the filed packing and ledger stubs, provide all the information required for an investigation.

None of the above operations takes more than a minute, and the same number of staff can handle considerably more business than when using the ordinary methods. The apparatus required to operate the photographic system can be operated by unskilled staff.

New PATRA Journal

The contents of PATRA's January journal, which appears in a new guise, include a pictorial record of progress at the site of the new laboratories at Leatherhead; an illustrated account of the Research Association's threefold service (advisory, information-intelligence, and research), a description of methods of making packages resistant to attack by insects; and an illustrated explanation of the effect of sodium vapour and mercury vapour street lighting on the appearance of printed posters. The new Journal is intended to be a bright, illustrated, and readable account of what the Research Association is doing, and plans to do, for its members. It will appear every other month.

Reads, Ltd.

Reads' E. H. pattern hoop enclosure fully open top metal containers are available in sizes from 7 in. to 22 in. and not from 7 in. to 2 in. as stated in the announcement (page xlii) of the February issue of FOOD MANUFACTURE.

Vacuum Plate Evaporators

The fully patented Dole vacuum cold plate evaporator developed by the Dole Refrigerating Company of Chicago is now being manufactured by Winget, Ltd. The plate is claimed to have many uses where refrigeration is required, and is fabricated of continuous steel tubing enclosed in a ¼ in. thick hermetically sealed jacket formed by two flat, smooth steel sheets welded together round the edges. Air from the jacket is then withdrawn to a high vacuum, exterior atmospheric pressure thus keeping the plate sides in firm contact with the tubing through which flows any commercial refrigerant which, in turn, absorbs heat through the surface of the plate. It is claimed that the refrigerating effect is constant over the entire plate surface. The plate, or series of plates, are connected to any standard refrigerating system. Where the refrigerant is Freon or methyl chloride the tube extensions are of copper, while steel pipe connexions are provided for use with ammonia.

The finished vacuum plates are coated with zinc or aluminium paint and are made in standard dimensions between 80 in. and 108 in. long by 22 in. wide, and can be supplied singly or assembled in series-connected units to form tiers of shelves. Very fast temperature pull-down is claimed when packaged food to be quick-frozen is placed in direct contact with the shelf surface. These units may equally well be used as shelf storage for perishables. Alternatively the plates may be fitted vertically or horizontally in insulated cabinets for quick-freezing, storage or display purposes, or used as cafeteria counters.

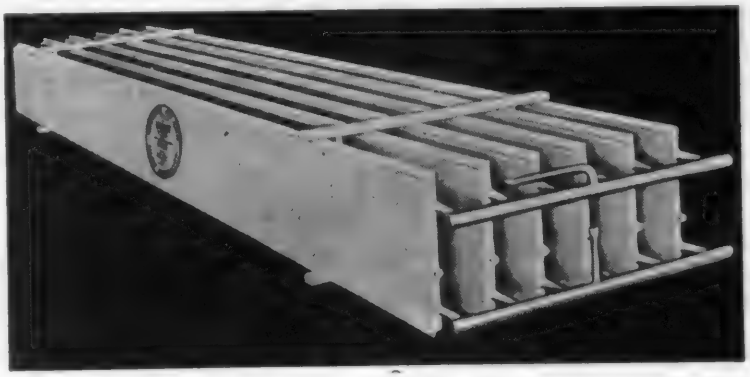
Plates for cold storage rooms are also supplied in standard lengths varying from 6 ft. to 9 ft. long by 12 in. wide, and longer plates will be available when raw material for manufacture is more readily obtainable. This type of plate is usually made assembled in banks of four, five, or six plates, which are suspended from the ceiling of the cold store, the refrigerant circuit being in series or parallel. Since the Dole plate is smooth and flat, frost deposits can easily be brushed or scraped off without interruption of the compressor cycle.

It is claimed that heat absorption per square foot of plate surface (both sides) per hour per degree F. temperature difference between refrigerant and medium surrounding the plate is 2 B.Th.U. in still air below 20° F., 2½ B.Th.U. when the air is above 20° F. and 12 B.Th.U. in brine or water.

When steel is in greater supply plates of very similar construction, but of greater thickness, will be manufactured for installation in insulated road and rail vehicles or for use during prolonged stoppage of the compressor.

Special solutions of low freezing point are introduced, during manufacture, into the vacuum space around the tubing and frozen down by connecting the plates, by detachable couplings, to a central compressor system during the night or at other periods when the vehicle is not required for service. The conveyance is then loaded with the pre-cooled product to be carried, the compressor system is disconnected from the plates and refrigerating effect is maintained thereafter by the melting of the frozen eutectic solution during the journey. An alternative method, when intermittent and comparatively short hold-over periods are required, is to mount the compressor on the vehicle.

Shelf plate evaporators in assembled unit for quick freezing, hardening rooms, storage, etc.



Evaporator plates suspended from ceiling for cold store refrigeration.

New Scottish Factories

Six new Scottish factories allocated by the Government to industry in the past five months will provide jobs for more than 2,200 people.

These include factories for bottling and dairy machinery at Portobello, canned fruit at Blairgowrie, and breakfast cereals at Cupar and Turriff.

Blackpool Exhibition

Arrangements have been made for a big "Country Comes to Town" exhibition to be held in Blackpool on August 20 in conjunction with the Fylde and District three-day agricultural show in Stanley Park, and will continue until September 6. It will be organised by the National Farmers' Union in collaboration with Fylde and District Agricultural Society.

Submersible Pumps

The most modern and efficient method of raising water from deep wells and boreholes employs a compact "submersible" electric motor-driven pump unit immersed completely in the water, being suspended by its delivery pipe. No driving motor or engine cumbers the ground at the well-head, and no special foundations or pumphouse are required.

The "Sumo" submersible pumping unit is simple to install, quiet in operation, and totally submerged. The squirrel-cage motor (A.C. only) has no commutator and no brush troubles. Its chief feature is the thin non-corrodible alloy sleeve which completely seals the stator windings from the water. Emulsive lubricant sufficient for 6,000 to 10,000 hours' running serves the journal and thrust bearings. Special devices retain the emulsion inside the motor and keep out foreign matter.

Sizes range from ½ to 55 h.p., with manual starting or fully automatic control. Capacities vary from 100 to 50,000 g.p.h., and suit boreholes from 6 in. to 12 in. internal diameter. Larger units are in course of manufacture.

OBITER DICTA

- There is no such thing as strong drink these days.—*Mr. James Glanville, M.P.*
- Half a mile is too long a journey if you want to have your fish and chips warm.—*Swinton Councillor.*
- School dinners consist, as far as I am able to ascertain, of beetroot nearly every day, with something cold. — *Letter in "Walthamstow Guardian."*
- Is it too wild a speculation to imagine that a day may come when controlled nuclear energy may be used to promote the growth of food crops?—*Mr. H. Thornton, B.Sc., Royal Dublin Society.*
- The quality of the meat we are getting now is poor. There is only one grade lower, and that is labelled "Not fit for human consumption." — *President of Chester-le-Street Butchers' Association.*
- No doubt the Minister of Food thinks that if, on the outside of a new civic public house, there was a swinging sign, "The Strachey Arms" it would at once become an earthly paradise. — *Wing-Commander Robinson, M.P.*
- We have four or five major Bills going through Parliament, none of which contributes one egg, one lump of coal, one house, one shirt, or indeed anything but an increased Civil Service and more form-filling and disturbance. — *Sir Ian Fraser, M.P.*
- It is the aim and practical policy of the Government to make the whole country a productive garden, from which the people of our land can be supplied with an abundance of health-giving food for many years to come at prices satisfactory to both consumers and producers.—*Mr. S. Dye, M.P., speaking at Maidstone.*
- If milk were put up in bottles of different shapes and sizes, if it were given fanciful names, and announced for what it really is—the greatest body builder and health restorer in the world—people would flock to buy it at fancy prices, but because it costs so little we seldom give its virtues a thought.—"*Certified Milk.*"

Five-Day Week

Wm. Gardner and Sons (Glos.), Ltd., announce that their head office and works in Gloucester will in future be closed on Saturdays, and no goods can be received on that day.

Resignation

Acting on doctor's advice to restrict his activities and on the eve of his departure to Australia, Sir Eric Palmer has resigned from the post of individual chairman of the South Regional Board for Industry set up by the Board of Trade.

Diesel Engines

Low fuel consumption, easy accessibility, and light parts are some of the advantages of the Ricardo Diesel Engines, details of which are contained in Publication B.R.S. 46, which may be obtained from the manufacturers, Peter Brotherhood, Ltd.

Roche in War-Time

Numbering some forty pages and with an attractive spiral binding and Cellophane wrapping, the booklet *Roche in War-Time*, published by Roche Products, Ltd., contains a full and comprehensive account of how one British chemical firm carried on during the war years. Plentifully illustrated with photographs, showing first-aid posts, rescue squads, sea cadets, fire brigade training, and other branches of staff activities, the booklet should make a most acceptable addition to the libraries of export firms.

The final section deals with the firm's production and scientific research.

Obituary

We regret to record the death of Mr. M. Hamburger, senior partner of M. Hamburger and Sons.

*

We regret to announce the death of Mrs. E. C. Jones on February 16. Mrs. Jones was a director of Samuel Jones and Co., Ltd.

Automatic Machinery

Machinery for tablet counting and filling, cap screwing and tightening, and double seaming is all described in pamphlets issued by Richard Brandt Automatic Machines. Of particular interest is the Universal counting machine for use by manufacturing confectioners for counting sweets or irregular cubes. This machine will handle all shapes of products, and can be used for any kind of material such as metal, bakelite, and compressed powder.

Science Today

Although only a small pamphlet, *Science Today*, issued by Weekly Science Newsletter Ltd., contains a good deal of interesting matter.

In one number, articles appear on such various subjects as Atom Photography, Ape-men from Africa, Washing-up and Bacteria, B.B.C. Plans, and The Photographic Plate as a Laboratory.

Published weekly, the pamphlet should be a welcome addition to the library shelves of those interested in modern scientific progress.

Appointment

Coventry Climax Engines, Ltd., have appointed Mr. John M. Morris as general sales manager. Prior to this appointment, Mr. Morris was with A. C. Wickman, Ltd., as London area manager, which position he recently resigned.

Friction Hoists

The post-war programme of the Vaughan Lift Engineering, Ltd., includes all types of lifts, cranes, and hoists. Three new designs of Friction hoists—petrol, electric, and belt driven—have also been brought out. These hoists are arranged to raise 5 cwt., which may be increased by the use of sheave blocks, if desired. Simple both in design and operation, they are ideal for small wall jib cranes, hoisting builders' materials, or sacks of food, corn, hops, etc., or for traction.

The belt and petrol-driven models can now be delivered *ex* stock, and electric hoists in six to eight weeks. By the end of August this year they hope to be in production with 15 cwt. models.

Mr. Arthur G. Enock

Having sold to Messrs. Aplin and Barrett, Ltd., his interest in Auto-Dairy Engineers, Ltd., Mr. Arthur G. Enock is retiring from his position of chairman and managing director. He is continuing his consulting and research and development work independently.

Coming of Age

Speaking at the twenty-first anniversary of the Edinburgh Essence Co., Ltd., which was celebrated with a dinner and dance on February 17, Mr. D. D. Curr, B.Sc., chairman and managing director, said that practically all the machinery and plant required for the extensive programme of reconstruction which had been already embarked upon, was now installed in new and extended buildings, and was in operation. This had increased production capacity and enabled them to deal more expeditiously than was possible during war years with orders, not only from the home trades, but also from the export markets.

Forty-Year Veterans Lunch Together

All members of the Simon Companies with forty or more years of service attended a luncheon given by Sir Ernest Simon, M.Inst.C.E., M.I.Mech.E., Governing Director of Henry Simon, Ltd. Nearly thirty of those present were "forty-year veterans" and more than a score of them are still at work.

Water Purification Plant

A petrol engine driven self-contained trailer type complete purification plant has been placed on the market by The Paterson Engineering Co., Ltd. After widespread use by the British Army during the war, details are now allowed to be published, and the matter is of particular interest for agricultural districts.

The equipment is capable of treating up to 3,000 gal. of water per hour, and operates on the ammonia-chlorine principle, which gives effective sterilisation without objectionable taste. The filtering medium used is kieselguhr (diatomaceous earth), giving a unit or layer which is much more compact and lighter than sand, while cleaning of the filters is easily carried out.

Scientific Periodicals

Active preparations are being made for the issue of a third edition of the *World List of Scientific Periodicals*. The last edition of this invaluable scientific reference work, issued in 1934 and covering the years 1900-1933, is now out of print though still in constant demand. It contains upwards of 33,000 titles of journals and includes the holdings of some 180 libraries in Great Britain and Ireland. The new edition, which is designed to include all the scientific and technical periodicals that appeared during the period 1900-1947 as well as the holdings of additional libraries, will therefore be considerably larger. Librarians are being asked to co-operate as before by sending particulars of all those journals on their shelves that do not appear in the second edition or are shown there as having no location in this country, to The Secretary, World List of Scientific Periodicals, c/o The Zoological Society of London, Regent's Park, London, N.W. 8, from which office further information may be obtained.

IFAP Conference

Arrangements are well in hand for the Conference of IFAP to be held in Holland from May 12 to 23. Count van Lynden van Sandenburg and Mr. H. Grevers of the Dutch Stichting voor den Landbouw, who are in charge of the organisation of the Conference for the host country, were in England during January to discuss arrangements with the President and Secretariat.

Among the items to be dealt with at the Conference are the ratification of the constitution and the establishment of permanent headquarters and staff. In addition the Conference will consider applications for membership and discuss questions arising out of the developments in intergovernmental food planning during the past year.

British Industries Fair

In view of enquiries received from industry, the Board of Trade announce their intention to open the British Industries Fair on May 5 as already arranged.

Nylon Industrial Brushes

Nylon, a true synthetic fibre produced in Great Britain by Imperial Chemical Industries, Ltd., is now used extensively in the manufacture of various types of industrial brushes. In food manufacture, where brushes of varying size find many important applications, nylon monofilament is particularly suitable. It is available in a range of thicknesses or diameter, depending on the type of brush to be made and the nature of the work to be performed. The individual monofilaments possess a very high strength and elasticity and are unaffected by hot water and many common chemicals. The fact that nylon brushes are designed for hard wear and a long industrial life is of the greatest importance to all manufacturers, particularly to those engaged in food processing where conditions of service are known to be severe.

Industrial Co-Partnership

Stressing the necessity for co-ordinated action on the part of industrial managements, Mr. Charles G. Renold, speaking before a meeting of the Industrial Co-Partnership Association on the subject of the present economic position, said that the situation was desperate, and the urgency of solving the many problems could not be too strongly emphasised.

The Government scheme for TWI (Training within Industry) could be modified to deal with the present crisis, and in particular in assisting managements in the dissemination of information on the Government's economic plans as detailed in the recently issued White Papers. In order for the scheme to meet with success, it must, said Mr. Renold, have the wholehearted support of the T.U.C.

The talk was followed by a lively discussion, during which Mr. Renold dealt with various suggestions and criticisms put forward by members. His audience were obviously wholeheartedly in support of some scheme for translating the Government's economic proposals into terms which the worker could readily understand and appreciate.

Royal Institute of Chemistry

The last three meetings of the Spring Programme of the Royal Institute of Chemistry will take place during April. A lecture on "Modern Trends in Cereal Chemistry in America and Elsewhere," given by D. W. Kent-Jones, B.Sc., Ph.D., will take place on April 16, and the Annual General Meeting will be held on April 18.

The programme will end with a dinner and dance on April 19 at the Lysbeth Hall.

Nutrition Bulletin

The Central Council for Health Education have commenced publication of a new booklet, which is intended for those who are interested in the application of nutritional knowledge in all the fields of social welfare and public health. It incorporates the bulletin issued for several years by the Children's Nutrition Council, and deals with the popular theories and habits in regard to food, and the importance of diet in social medicine.

Its articles are concise, topical, and written in non-technical language. Reports not otherwise accessible are summarised, and the bulletin as a whole reflects the growth of an applied science of particular interest not only to members of the medical profession, but also to canteen managers and others.

The bulletin is issued every two months.

Water Heaters

Hot water from steam is immediately available with the "Cox" water heaters, which are silent in operation at all pressures and temperatures. No steam traps are employed, and steam is consumed only when the heater is in operation. The heaters are instantaneous in action, supply water at any temperature from cold to hot, and offer a considerable saving in steam and water consumption.

An illustrated brochure issued by the manufacturers, Cox Engineering Co., Ltd., provides details of the different types of heaters.

Herring Industry Expansion

FORECAST BY SIR FREDERICK BELL

The expansion of the herring industry to cover a wide range of products was promised by Sir Frederick Bell, chairman of the Herring Industry Board, when speaking on February 5 to the Royal Philosophical Society of Glasgow.

Sir Frederick said that the neglect of one important market —the manufacture of herring oil and meal from surplus catches— had been rather evident in Britain, whereas Norway had seventy-four factories for this purpose and had found the products an important source of feeding stuffs. He also spoke of the loss of the Russian market, which had dealt a shattering blow to the country, and especially to Scotland, where the salt curing of herring in barrels for export is mainly done. Before the war Russia took 1,000,000 barrels annually, and a further 1,000,000 barrels were exported to Finland, Lithuania, Latvia, Esthonia, Poland, and Germany.

With regard to the Board's Shetland experiment for the expansion of the industry, he said a big extension of kippering for export was included in the plans for 1948.

This was being done by established private kippering firms with the Board supplying cold storage and refrigerator transport to the mainland.

Meantime Mr. Strachey has emphasised that the increased output of oil and meal (above the output from the 1,894 tons of herring sent to the reduction plants for processing in 1946) would not in itself allow an increase in the fat ration.

Hygienic Meat Deliveries

Built on to a 1947 six-cylinder Albion chassis, J. Wharton and Sons have designed a new and hygienic dust-proof meat van. Although a certain amount of space has been sacrificed in the design of the van, it can carry approximately five tons of meat. It has special compartments for offal, and the main housing is equipped with roller-type, dust-proof, vertically sliding doors through which the carcases can be easily handled. The ventilation of the van is affected by Revo roof ventilators.

OVERSEAS

New Sugar Cane Variety

A new crossbreed variety of sugar cane has been tested in the Vakhsh River Valley, Tajikistan, announces the *Soviet Monitor*. Last year forty-five tons of cane per acre—almost three times as much as yielded by standard American varieties—were gathered there. It has been calculated that this quantity of sugar cane will provide for the production of some 260 gal. of rum.

Soil-Less Vegetable Gardens

Metropolitan rooftops could become vegetable gardens with a new soil-less system being used by the U.S. Army near Tokyo, according to the *New York Journal of Commerce*. Designed for areas where garden soil is scarce, the Army's gardens consist of eighty acres of concrete troughs, filled with gravel and planted with vegetable seedlings which are fed periodically with chemical nutrients. The Army claims the vegetables grow faster and to a larger size than in the usual garden soil.

March Grain Exports Allocated

The U.S. Department of Agriculture, on January 31, announced export allocations of 1,500,000 long tons of wheat, flour (in wheat equivalent), maize, grain sorghums, and barley (approximately 57,739,000 bushels total) for March. This is the largest tonnage scheduled for any month since the beginning of the post-war grain export programme in the summer of 1945. Export allocations for February, 1947, total 1,204,500 long tons.

The March allocations of 1,500,000 long tons consist of 494,000 tons of wheat, 434,000 tons of flour in wheat equivalent, 489,000 tons of maize, 51,000 tons of grain sorghums, and 32,000 tons of barley. The March allocations of flour include a proportion of the quantities which had been announced in December for ten of the countries now under export licence, covering the January-March, 1947, quarter.

What America Eats

The average person in the United States eats approximately 500 lb. of fresh fruit and vegetables annually, and drinks more than 15 lb. of coffee.

Tractors for Malayan Food Drive

Further large areas of jungle land will be brought under mechanised farming with the arrival of 110 Diesel tractors in Malaya. The machines arriving consist of twenty giant caterpillar Diesel tractors, each weighing 34,164 lb., nine weighing 24,000 lb. each, thirty-six light tractors of 10,000 lb. each, and forty-five smaller types. These huge tractors will help achieve the target of opening up 80,000 acres for food crops under the Short Term Food Production Scheme. At present 25,000 acres to 30,000 acres are being cultivated under this scheme.

The new tractors will be used at first to clear up the jungle areas, uprooting stems, and removing felled trees. More machines will be used as soon as these clearings are made.

Distribution of the tractors to Government farms will be made by road, rail, and sea.

Frozen Pies

A new process for the manufacture of frozen pies, which has been patented by the Cease Commissary Service of Dunkirk, N.Y., completely eliminates all processing, freezing, and thawing. The fresh fruit is simply washed, the required amount combined with sugar, placed in a raw crust, and the pie immediately frozen at a temperature of ten degrees below zero. All the goodness of the fruit is thus saved. When the pie is needed, it is taken from the freezer and baked.

Certain difficulties had to be overcome before the pies were entirely satisfactory. The crust, which was first mixed in a big machine equipped with giant finger-like mixers, was found to be tough. It is a well-known fact that refrigeration dehydrates, and experiments showed that the trouble lay in the water which must be added to the flour and shortening.

The crust was therefore rolled out in a machine equipped with sheet steel rollers, and placed in an oven fitted with a refrigeration unit. The moisture in the crust was drawn off and settled on the cells just as in any ordinary refrigerator. The result produced a light, flaky crust. Pies may be left in their frozen state for as long as twelve months, and be as delicious as ever when baked.

The Cease Commissary Service plan to open up five branch plants, and apple, cherry, strawberry, and rhubarb pies will come off the assembly line at the rate of twenty-five a minute, or 36,000 in one day.

FAO to Call Rice Conference

A conference is to be held in South-East Asia within the next six months of all major rice-producing and consuming countries, to consider steps necessary to alleviate continued rice shortages in India and elsewhere. The decision was reached by a preparatory commission of the United Nations Food and Agriculture Organisation, which for the past three months has been working on plans for a world food programme equitable to producer and consumer alike.

The commission approved a report declaring that no definite conclusions had been reached on the creation of a Rice Board in South-East Asia as urged by the Indian delegation, but that it undoubtedly merits detailed consideration.

In any case it seemed probable that Governments would play a more active role in the future in stimulating production and controlling price of rice.

The report said that rice supplies available for allocation by the International Emergency Food Council this year were barely 40 per cent. of minimum requirements. It would take a number of years before the industry was rehabilitated and adequate reserves built up for the prevention of famines.—*Reuter.*

Import Restrictions Relaxed

The full statement of the Australian Prime Minister on the relaxation of import restrictions on British goods has now been issued.

It has been decided to exempt a further wide range of goods of United Kingdom origin from the operation of Customs (Import Licensing) regulations, and the only British goods still subject to import licensing control will be a relatively small list of items of the less essential type. All goods not contained in this list will be entirely free from import licensing control.

Enquiries should be addressed to the Administrative Officer, Central Import Licensing Branch of the Department of Customs, 52, William Street, Sydney, or to Collectors of Customs.

African Groundnuts Production

"The most important single act of Government in the history of British Tropical Africa" is a description that has been applied to the new "Plan for the Mechanised Production of Groundnuts in East and Central Africa" (Cmd. 7030).

The plan is based generally on the report of the Wakefield mission of enquiry which visited East Africa in late summer 1946, and its immediate purpose is to obtain new supplies of fats for the U.K. There is a world shortage of oilseeds, oils, and fats which, in the absence of special measures on a large scale, may extend even beyond 1960. The main use of the groundnut crop is in the production of groundnut oil, which is largely used in the manufacture of margarine, cooking and salad oils. The oil content of the groundnut is 45 per cent. to 50 per cent., while the residual press-cake left after the extraction of the oil from the kernels forms a valuable cattle food, containing about 45 per cent. of protein.

It has been decided to proceed immediately with the clearing and developing of approximately 3½ million acres of bushland in Tanganyika, Northern Rhodesia, and Kenya. The maximum yield will be obtained in 1950-1951.

Soviet Vitamin Research

In their search for new material for vitamin production, Soviet scientists have discovered that skimmed milk contains large quantities of Vitamin B_2.—*Reuter.*

Danish Pig Population

According to the latest census the number of pigs in Denmark has increased by about 16,000 pieces to 1,704,000, compared with the census on December 28 last year.—*Reuter's Trade Service.*

Plastic Brine Vats

DEVELOPMENTS IN OLIVE PACKING PROCESS

Two gigantic transparent plastic olive brine vats have just been developed for use in an olive packing process after months of research.

The war-time bomber nose plastic met the exacting specifications for a material that would be non-corrosive and yet chemically inert, shatter-resistant, and transparent. The former qualifications are important because brine vats contain lactic acid, salt, and water.

The unusual transparency offered by the plastic is desirable in that it enables the operator to check the quantity of solution, as well as the mixing speed.

The sides of the huge vats were made from two sheets of transparent Plexiglas by heating the acrylic plastic to 250° F., forming the sheets into semi-cylinders, and allowing them to cool. The rigid, curved sections were then joined in a conventional V-shaped tongue and groove cemented joint. The finished joint, practically invisible, will resist hard blows without cracking or splintering. Bases for the vats were made of circular sheets and cemented to the side sections.

The vats, mounted one above the other, each hold 300 gal. of brine. In the lower vat, the brine is mixed with a high speed propeller mixer, then transferred to the upper vat through a tube. From this upper vat the brine flows, by gravity feed, to the packing process, where a pre-determined amount is automatically released into each bottle of olives.

The vats, mounted one above the other, each hold 300 gal. of brine.

Manchurian Soya Bean Production

According to estimates made by the China Vegetable Oil Corporation, soya bean production in Manchuria, China's main producing area, for the season 1946-1947, is estimated at 1,500,000 tons. This compares with an average of 3,000,000 tons in the past decade, and an all-time peak of 6,000,000 tons.

Recent reports state that there has been a 100 per cent. rise in prices since Christmas, and the price to the United Kingdom and Europe is now £42 per ton, FOB Manchurian ports. — *Reuter's Trade Service.*

More Sugar for Britain

Britain is to receive 392,000 short tons of sugar more in 1947 than she received in 1946, according to a statement issued by the International Emergency Food Council.

Announcing allocations for 1947, the IEFC said the United Kingdom would be entitled to obtain from aggregate domestic and foreign sources 2,473,000 short tons of sugar compared with 2,081,000 allocated to Britain in 1946. Of the supplies that the United Kingdom is authorised to secure for itself, domestic production is expected to furnish 622,000 short tons, while the remainder must be obtained, under joint agreement with Canada, from Cuba, the British West Indies, the Dominican Republic, Haiti, and certain other, at present undesignated, sources which expect to have substantial quantities of sugar available.

These may include the Netherlands East Indies. The exact size of the quantities available is at present unknown, the IEFC stated.

Canada's allocation is 611,000, and that of the U.S.A. 6,800,000 tons—1,367,000 tons more than the 1946 allocation. The allocations were allotted to the twenty-four claimant nations, so as to give them at least 75 per cent. of their average pre-war consumption per head. The United Kingdom, the U.S. and Canada, however, received slightly more than 75 per cent.

MINISTRY NEWS

Liquid Glucose

Owing to the increase in the cost of maize and maize starch, the Glucose (Control and Maximum Prices) (Amendment) Order, 1947, has been made, increasing the price of liquid glucose by 6s. per cwt. This Order came into effect on February 1.

Black and White Puddings

An Order came into operation on February 28, 1947, amending the Bread (Rationing) (No. 2) Order, 1946, to make it clear that black and white (or mealy) puddings are not to be regarded as flour confectionery for the purposes of the rationing scheme.

A Farmer's Guide

A third edition of *A Farmer's Guide to the Sale of Corn*, summarising the provisions of the current Orders relating to home-grown cereals, has been prepared and copies are now available.

The *Guide* sets out the arrangements by the Government for the production, use, and disposal of corn crops (including pulses), and contains sections on the marketing and drying of grain.

The handbook has been widely appreciated since its original issue by the Ministry in December, 1942, and farmers and merchants alike will find it a useful book to keep by them for easy reference.

Price of Flour Confectionery

An Order amending the Flour Confectionery (Control and Maximum Prices) Order, 1946, came into operation on February 16, 1947.

Owing to recent increases in the cost of various ingredients, it has become necessary to raise the ceiling price of flour confectionery, and the amending Order authorises manufacturers to charge up to 2s. 6d. per lb. for cake, provided that in the case of articles sold for more than 1s. 6d. per lb. certain specified conditions are observed. The first condition is that any cake sold at a price exceeding 1s. 6d. per lb. must have a minimum combined content of fat, sugar, and/or dry egg solids of 40 per cent. The second condition is that the selling price must not exceed two and a half times the ingredient cost (for cakes with a minimum fat and sugar content of 14 per cent. sold for 1s. 6d. per lb. or less, the permitted ratio between selling price and ingredient cost remains at 3 to 1).

The new Order also specifies the method for calculating the maximum price of a cake made partly or wholly from ingredients provided by a customer.

In addition, a new maximum price of 1s. per lb. is prescribed for uncooked pastry.

On and after February 24, traders were permitted to sell wedding cakes free from price control, on the authority of a permit obtained by the purchaser from the local Food Office.

German Import Trade

Trading with the Enemy Regulations, which have prevented United Kingdom firms from trading with Germany, have been lifted, as from March 4. This step has been timed to fit in with similar action which is being taken by the United States. Details of the procedure under which trade may take place between the United Kingdom and the British and American Zones of Germany have been published by the Board of Trade. This refers only to exports from Germany; imports into the two zones will for the time being be solely on Government account. Separate announcements will be made on trade with the French and Russian Zones.

Traders must obtain licences for all goods except those which may be imported from all countries under an Open General Licence. Importers should apply to the Sundry Materials Branch of the Board of Trade, 10, Old Jewry, London, E.C.2. The importer's bank will be able to advise him about conditions under which goods may be imported for re-export.

Appointment

The Minister of Agriculture and Fisheries, in consultation with the Secretary of State for Scotland, and on the recommendation of the Agricultural Machinery Development Board, has approved the appointment of Mr. W. H. Cashmore, B.A.(Cantab.) Agriculture, N.D.A., as Director of the National Institute of Agricultural Engineering, in succession to Mr. S. J. Wright, M.A., who has resigned the directorship to take up a commercial appointment in agricultural engineering. Mr. Cashmore's appointment as Director of the Institute dates from March 19, 1947.

Cocoa Beans Allocation

The total exportable surplus of cocoa beans, including cocoa butter in terms of beans, for 1946-1947 is estimated at 612,320 long tons.

In order to provide for balancing out of total imports against the allocation of each importing country, where an importing country is unable to give an undertaking that their purchases and imports will not exceed their allocation, 25 per cent. of such country's allocation of British West African cocoa will be held until progress of purchases and shipments is reviewed at a meeting of the Committee of Cocoa to be held in London in May.

International Cocoa Committee

At a meeting of the International Emergency Food Council Cocoa Committee held in London on January 31, 1947, it was decided to continue the world allocation of raw cocoa beans, cocoa butter, and unsweetened chocolate couverture, during the allocation year October, 1946, to September, 1947.

Final recommendations were prepared for submission to the Council in Washington for their approval.

Details of individual countries' allocations will be released when Council approval and member Government's concurrence are obtained.

Open General Licence

An Open General Licence, with effect from February 4, 1947, has been granted. The goods include olives in brine packed in casks, and individual licences to import these from any country are no longer required.

Factories Act, 1937

Regulations made on February 3, 1947, entitled the Factories Act Holidays (Different Days for Different Sets) Regulations, 1947 (S.R. & O. 1947, No. 184) revoke Orders made under earlier Factory and Workshop Acts on December 20, 1882, and October 13, 1908, dealing with the same subject, and came into force on February 17, 1947.

The object of these Regulations is to bring up to date and supersede certain Orders made under the old Factory and Workshop Acts in 1882 and 1908. Under Section 78 of the Factories Act, 1937, the occupier of a factory has to allow to the women and young persons employed in the factory six weekdays in the year as whole holidays. In England and Wales the Act specifies Christmas Day, Good Friday, and Bank Holidays, while in Scottish Burghs two of the days are fixed by the Town Council. But the occupier of a particular factory can substitute another day for any of these, subject to giving at least three weeks' notice.

In general, the days must be the same for all the women and young persons employed in the factory; but in the case of some kinds of factory (at present those specified in the Orders of 1882 and 1908) the occupier may, as a special exception, fix different days for different individuals or sets of the women and young persons employed in the factory.

Among the descriptions of factories specified in the Schedule to the new Regulations are:

> Factories in which is carried on the making or adapting for sale of any article of food or drink for early consumption or of a perishable nature or with constituents of a perishable nature, and factories in which the business of washing or filling bottles or containers for such articles is carried on.
>
> Factories to which the special exception provided for in section 95 of the Act (as to factories where milk is treated) applies.

Exports of Processed Foods

CHANGES IN RESTRICTIONS

The following minor changes have been announced in the restrictions on food exports.

Group A Foods (export permitted generally, subject to current supply conditions). The following items are now included in this Group:

Items transferred from Group B: Canned soups, patent barley, meat extracts, starch food powders.

Items transferred from Group C: Spices, cinnamon, mace, nutmeg, pepper.

Items not previously specified: Cod liver oil, dextrine, hops, hydrolised protein, vitamin "A" concentrates.

Export licences are required for all the above items, except cinnamon, and applications will be considered in the light of current supply conditions.

Group B Foods (export permitted only under approved programmes to Empire countries and certain Middle East countries). Certain items have been transferred to Group A, as above, and the following items are now included:

Items transferred from Group C: Dairy Products—butter, cheese, processed milk (evaporated dried whole, sweetened condensed, roller skim, and spray skim), dried fruit, dry lentils.

Group C Foods (export permitted only in accordance with allocations of the International Emergency Food Council [formerly the Combined Food Board]): Certain items have been transferred to Groups A and B, as above.

Price Decontrol of Cherries

An Order revoking the Cherries Order, 1945, and the Imported Cherries Order, 1946, came into force on February 9, 1947, to remove the price control of cherries. It is hoped, by removing price control, to encourage larger supplies from home and overseas sources.

Traders are reminded that any record of a transaction, kept in accordance with the requirements of either of the original Orders, must, notwithstanding the revocation of these Orders, be retained for one year from the date of the transaction.

Edible Gelatine

The Edible Gelatine (Control) Order, 1947 (S.R. & O. No. 161 of 1947), which came into force on February 23, 1947, prohibits the use of gelatine in the manufacture of food except in certain specified types of manufacture which are set out in the Schedule to the Order. The Order also defines edible gelatine and prohibits the use of any gelatine except edible gelatine in the manufacture of food.

The Minister of Food has found it necessary to make this Order as the supply position of gelatine is critical, and it is necessary to see that available supplies are used to the best advantage and for types of food manufacture where it is an essential ingredient.

Token Imports

Token Import arrangements have been extended to Finland and Italy.

Token Imports of the goods included in the scheme will accordingly be admitted from individual manufacturers in these countries at the yearly rate of 20 per cent. by value of each manufacturer's pre-war trade with the United Kingdom in the goods in question.

Applications for licences to import the listed goods will be considered only when accompanied by a Token Shipment Voucher identifying the goods which are the subject of the application with those of a specified manufacturer in Finland or Italy.

The Finnish manufacturer should only apply for Token Shipment Vouchers to the Licence Committee, Helsinki (Helsingfors), Finland.

The Italian manufacturer or his export agent should apply for Export Vouchers to the *Instituto per il Commercio Estero* in Rome.

Applications from British importers for import licences under these arrangements cannot be considered in advance of the receipt by Import Licensing Dept. (189, Regent Street, London, W.1) of the requisite Token Import Vouchers. Premature applications will prove only a source of confusion and will not assist in any way to secure favourable consideration for the subsequent applications duly accompanied by the necessary Vouchers.

The procedure set out above does not affect applications for import licences for goods which are not included in the items subject to the Token Import arrangements. Such applications will continue to be dealt with under the existing procedure.

Milk Powder

A new Order came into effect on February 12, 1947, consolidating the Milk Powder (Maximum Prices) Order, 1941, as amended. The Order includes provision for an increase in the maximum wholesale price of skim spray powder from 75s. 6d. to 120s. per cwt., and of skim roller powder from 70s. to 114s. 6d. per cwt. The corresponding Ministry's selling prices will be 113s. and 107s. 6d. per cwt. respectively.

The above prices will apply to all sales of skim milk powder with the exception of Household Milk Powder and milk powder sold for animal feeding purposes.

Some skimmed milk powder will be available for distribution to manufacturers of chocolate and sugar confectionery, biscuits, cake and flour confectionery, ice cream and ice cream powder mixes. Distribution will begin as soon as the necessary arrangements can be completed, and manufacturers receiving milk powder for these purposes should have received their permits during March.

Fibreboard Cases

The supply of paper and board for packing still falls short of requirements, and bakers are finding that suppliers cannot meet their full demands. One way in which bakers who use fibreboard containers can help is to arrange for all fibreboard cases to be returned to them for re-use. This economy was practised during the war and may still be in operation in some instances. There is every reason for its continuance, and if any baker has stopped the practice he is strongly advised to revive it.

Meat Products and Canned Meat

An Order came into force on February 2, 1947, which provides for an increase in the maximum prices of sausages in hog casings and for small additional charges to be made on home-packed canned meats delivered to certain remote areas in Scotland. Apart from these changes the new Order is a re-enactment of the Meat Products and Canned Meats (Control and Maximum Prices) Order, 1946, which it revokes.

The increase in the price of sausages in hog casings, which will be ½d. per lb., has been necessitated by a rise which has taken place in the price of hog casings in the United States, the principal source of supply. The revised maximum prices are as follows:

	Wholesale Price per lb.	*Retail Price per lb.*
	s. d.	*s. d.*
Pork sausages in hog casings ..	1 0½	1 2½
Beef sausages in hog casings ..	10½	1 0

There will be no change in the prices of sausages in sheep casings which form a substantial proportion of the present output. The maximum prices of sausages in sheep casings are ½d. per lb. higher than those given above for sausages in hog casings.

An additional charge of ½d. or ½d. per lb. according to the locality is permitted on imported meats delivered to certain remote areas in Scotland. The new Order extends this provision to home-packed canned meats also.

Information and Advice

Filling Cream

B.1680. *Could you please give us a recipe for cream fillings or substitutes which we could make without albumen, and also names of suppliers of filling machinery?* (Lanark.)

The best filling creams generally contain a percentage of egg albumen. However, it is possible to use dried egg in place of this and make a good cream filling. The following is a recipe:

4 lb. sugar
2 lb. glucose
1 pt. water
1 pt. reconstituted egg
4-6 lb. unsalted margarine
Vanilla essence

The sugar, glucose, and water are heated to 240° F. The egg is whisked and the prepared sugar solution poured over it and the whisking continued until cool. The margarine is then added gradually, the mixture being continually beaten until light.

Names and addresses of suppliers of appropriate equipment were provided.

Preservation of Cherries

B.1649. *Would you please give us information on the preservation of cherries in SO_2 water in wooden barrels, and what concentration you would recommend.* (London.)

The treatment of cherries is in many ways similar to jam fruits. The object of preservation in this case is to prepare firm cherries of light straw colour, free from blemishes, which will take artificial colouring well and absorb sugar freely. The chief outlet is to the *glacé* and maraschino trades. The fruit is sulphured cold with sufficient calcium to give the required degree of hardness. The process described below is that used in British Columbia. The degree of ripeness is important and may be judged by appearance or with a refractometer.

The cherries are freed from defective fruit and barrelled within about 12 hours of picking, 240 lb. in a 40 gallon paraffin-lined barrel. The preservative solution, a 1 per cent. solution of sulphur dioxide containing 6 lb. of calcium carbonate per 1,000 gallons, is added and the barrel closed and given a quarter turn every day for ten days. On the fifth and tenth days the bung is removed and the barrel filled with preservative solution. In this condition the fruit may be removed for pitting and grading and may be returned to the barrel, which is filled up with the same preservative solution.

Satisfactory preservation of fruit in barrels is seen to depend on careful observance of the following points: (1) the fruit should be carefully prepared before adding the preservative. This includes cleaning where necessary and cooking in the case of blackcurrants, plums, etc.; (2) the preservative solution should be suitable for that particular fruit, calcium salts being added when hardening is desired and avoided when this would be objectionable; (3) the preservative must be evenly distributed in the barrel. This is effected by adding it in parts as the barrel is filled with fruit and rolling the barrel occasionally; (4) fruit should be kept completely covered and evaporation made up by adding more preservative solution; (5) access of air is undesirable; (6) pulp for sale should not contain more than the legal quantities of sulphur dioxide; (7) use of clean barrels.

Information Supplied

B.1619. *Literature dealing with small scale production of ice cream.* (N. Ireland.)

B.1622. *The use of gum tragacanth in tomato sauce.* (India.)

B.1624. *Preservatives in the fruit juice industry.* (Tanganyika.)

B.1625. *The use of tin containers for concentrated orange and lemon juice.* (South America.)

B.1638. *Further details of the anhydration process mentioned in* FOOD MANUFACTURE, *January*, 1947. (Sussex.)

B.1639. *Manufacturers of machinery for making brushes and block tablets of 1 oz. size.* (Surrey.)

B.1640. *Firms manufacturing plant required for the preservation of fruit and vegetables on a moderate scale.* (Dorset.)

B.1642. *Manufacturers of cellulose wadding and wood wool.* (Somerset.)

B.1643. *Suppliers of dehydrated potatoes.* (Devon.)

B.1644. *Address of the American firm producing a new bag-making machine.* (Surrey.)

B.1645. *Firms manufacturing equipment for the production of water ices.* (Glos.)

B.1647. *Literature on the manufacture of breakfast cereals and addresses of firms manufacturing machinery for their production.* (London.)

B.1648. *Further information regarding the composition of gravy powder.* (London.)

B.1650. *Firms supplying 7 lb. jars.* (Eire.)

B.1651. *Manufacturers of pumps for glucose and sugar syrup.* (Denmark.)

B.1655. *Suppliers of packaging machinery.* (Australia.)

B.1661. *Recipes for the making of meat spices.* (Holland.)

Information Required

B.1657. *Suppliers of machinery for making paper drinking straws.* (Surrey.)

B.1658. *Name and address of the manufacturers of "Never-scratch" pan scrubs.* (Shropshire.)

Recent Patents

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents," and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Abstracts of Recent Specifications

Improvements relating to the Preservation of Meat

This invention relates to the preservation of meat by drying in such a manner that on reconstitution with water the product regains the flavour and texture of freshly cooked meat.

Specification No. 556,605, in the names of one of the present applicants and others, describes a process for preserving meat containing fats in which the meat including fat is minced and then cooked, the liquor formed during cooking is incorporated with the minced meat, this being necessary for the full retention of flavour and nutritive value, and the mix dried in such a way that its temperature does not exceed 160° F. The liquor is preferably concentrated before being added to the cooked minced meat, and the cooking operation can be preceded by a preliminary drying operation.

The present invention is a process for preserving meat, which may contain fat, *i.e.* the fat of the meat need not be removed, in which the meat is cooked, is divided into substantial pieces before or after cooking, the liquor formed during cooking is concentrated and incorporated with the pieces, and the mix is dried, preferably in such a way that its temperature does not exceed 160° F.

The presence of fat has a considerable influence on the time necessary for drying and the fat content of the material put into the drier should not exceed 30 per cent. by weight (calculated on the dried meat), and may with advantage be considerably less. Fat may be added to the meat after drying, which may be the fat of the meat or, where the meat is very low in fat, some other edible fat. This addition may be made in a mixing machine by pouring the fat in a semi-molten state over the chunks.

When a batch drier is in use, it is of advantage to maintain a high relative humidity at the beginning of the run. The humidity is then allowed to fall off naturally as drying proceeds and the drying rate decreases.

The drying should be carried on until the overall moisture content of the dried meat is not greater than 15 per cent. by weight on a fat-free basis. On account of the size of the pieces this in effect means that the surface layers are drier and the cores moister than this, but with the specified water content it is unlikely that bacterial multiplication will occur as the cores, where the moisture content of the meat would be sufficient to allow it, are virtually sterile, both because the substance as distinct from the surface is usually sterile, and because the meat is substantially sterilised by the cooking operation.

One convenient way of carrying out the cooking and sub-division is to cut the raw meat into thick slices, cook sufficiently to brown the meat throughout and render it soft enough to be dealt with by a cubing machine, say for an hour, and then pass the slices through a machine which cuts the slices into cubes or elongated chunks. It is characteristic of the pieces used in the present invention that they will roll and pour, and they can moreover be dried on a through-draught drier. When drying is complete the pieces can easily be compressed into blocks, or directly into metal containers so that the density of the compressed material is not less than 0·9. Access of oxygen to the packed material may be prevented by packing in a neutral gas or by filling the voids in the containers with fat, preferably derived from the same animal species.

577,361. *Edgar Charles Bate-Smith, Stanley Miles Partridge, Alexander Hadfield Sheed, and Roland Gordon Westall.*

Specifications Published

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

581,500. BERKEL AND PARNALL'S SLICING MACHINE MANUFACTURING CO., LTD., and THOMAS, H.: Slicing machines.

581,524. GADD, A.G., and TURNER, A. W.: Sterilising apparatus.

581,525. B. B. CHEMICAL CO., LTD., PUDDEFOOT, L. E., SWIRE, W. H., and WOODS, A. D.: Compositions suitable for use for adhesive or sealing purposes.

581,548. FERMENTATA AKT.-GES.: Production of cheese with an artificial rind.

Trade Marks

The list of trade marks of interest to readers has been selected from the "Official Trade Marks Journal" and is published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

DEL-ECO.—634,733. Tea, coffee, cocoa, baking powder, rice, tapioca, sago, gelatine (for food), and barley prepared for human use, all for sale in Northumberland, County Durham, Yorkshire, and Middlesex. **George Hill and Co. (Stockton), Ltd.**, 14, Prince Regent Street, Stockton-on-Tees; Merchants.

HAPPIOATS.—637,968. Oat preparations for food for human use. **The Caledonian Milling Co. (Aberdeen), Limited,** Caledonian Mills, Palmerston Road, Aberdeen; Millers, and Grain and Produce Merchants.

DEWDAWN. — 638,538. Canned cream. **Macpherson, Train and Co., Ltd.,** Adelaide House, London Bridge, London, E.C.4.; Produce Importers.

MACFIE'S.—642,249. Sugar, syrup for food (not medicinal and not for making beverages), and treacle. **Macfie and Sons, Ltd.,** H15, Exchange Buildings, Liverpool, 2; Sugar Refiners.

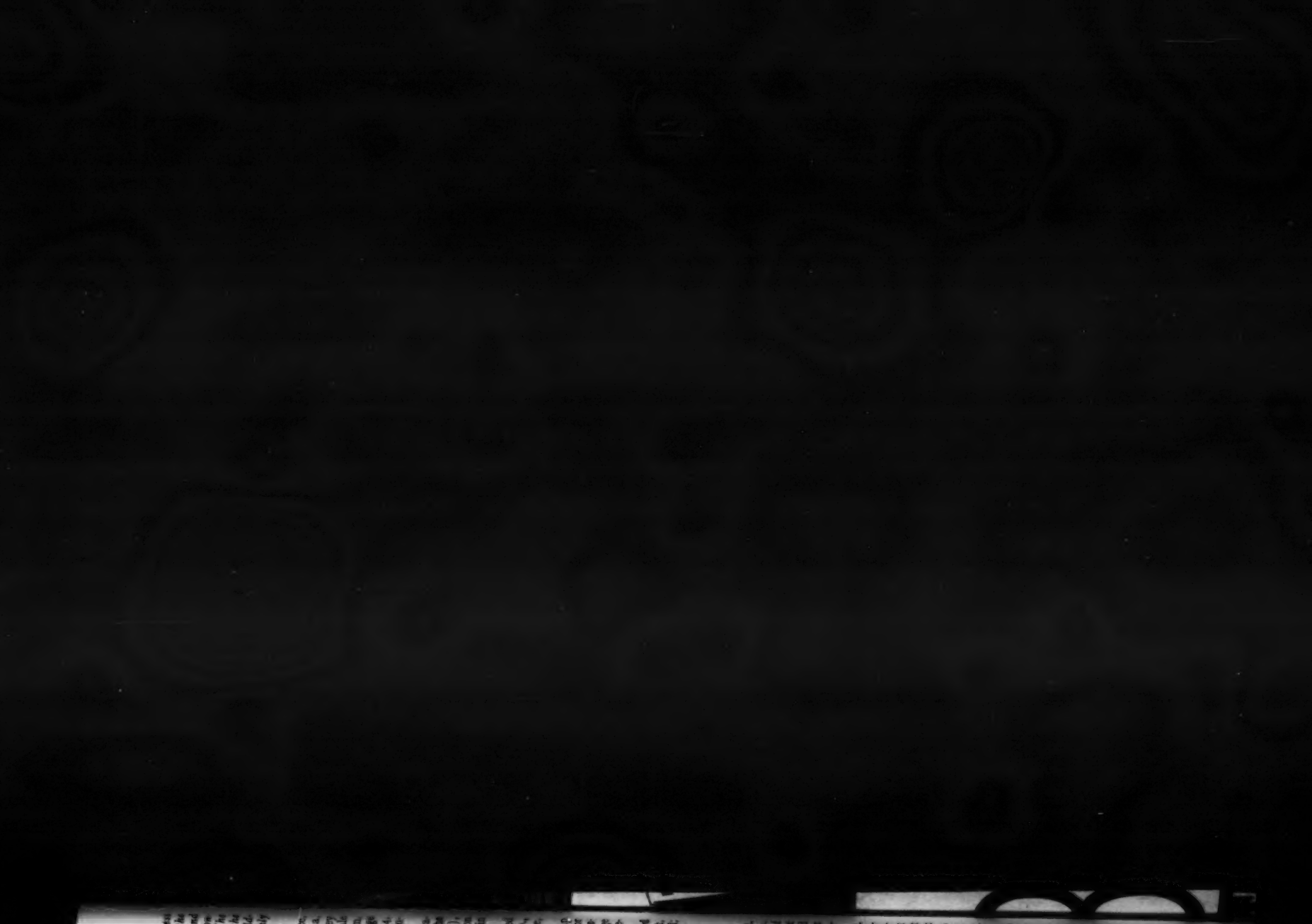
LEMOYA.—642,662. Tea. **Leonard Norton Wright,** 82A, Bond Street, Dunedin, Dominion of New Zealand; Merchant.

New Companies

Alfred and Company, Limited. (416405.) 290, Kensal Road, W.10. To carry on bus. of manufacturers of and dealers in machinery and plant for use in dairies, ice cream and food factories, etc. Nom. cap.: £100 in £1 shares. Dir.: A. Cesqua, 24, Paddington Green, W.2.

Refrigeration (London), Limited. (416470.) To carry on bus. of manufacturers of and dealers in refrigerators, etc. Nom. cap.: £5,000 in £1 shares (3,000 cum. pref.). Dirs.: not named. Subs.: D. Currie, 28, Great Queen Street, W.C.2 (acct.); L. Joyce, 6, Heene Road, Enfield (acct.).

Taken from the Daily Register, compiled by Jordan and Sons, Limited, Company Registration Agents, 116, Chancery Lane, London, W.C. 2.

Erratum

The new company mentioned on page 96 of the February issue of FOOD MANUFACTURE (registration number 416009) should read J. and R. Dawson (Manchester), Limited.